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VOLUME XXXIII

RESULTS
of
IONOSPHERIC DRIFT OBSERVATIONS
obtained during
I.G.Y. and I.G.C. 1959

Compiled by
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FOREWORD

WHEN it was decided to have routine observations of ionospheric drifts during the IGY the total number of such observations was still very small. Only very few stations had been doing these on a routine basis. The physical interpretation of the resulting data was not very clear and intercomparison experiments with the different methods had not been seriously made. The methods in use were:

- D1 Intercomparison of the time shift between fadings observed on three antennae separated by a distance of roughly a wavelength. The reduction is done either by the method of similar fades or by a correlation analysis; a third method, that of the Pütter-circle has also sometimes been applied.
- D2 Drift of meteor trails determined by different combinations of Radar- and Doppler-techniques.
- D3 Intercomparison of fieldstrength fluctuations of cosmic radio waves observed on three antennae separated by a distance of approximately 10 km (Scintillation method).

The objectives of the IGY observations were rather extensive:

- (1) To promote the physical interpretation of the phenomena in general and of the resulting parameters in particular;
- (2) To intercompare the different methods by simultaneous observations at the same location;
- (3) To obtain a widespread geographical coverage of observations.

If we consider the data obtained during IGY/IGC it is evident that these objectives have not been attained. Only modest progress has been made, which will be summarized in this volume. It became apparent that another objective had to be met in order to have significant data:

- (4) To obtain a satisfactory time coverage of the observations so that the rather important statistical dispersion of samples can be averaged and so that the systematic variations during an hour become clearly apparent.

Once again it appeared that a fairly large number of detailed, individual ionospheric observations are required to show systematic changes. A first result of this remark can be seen in the presentation used in this volume: only statistical distributions over adequate intervals seem to be significant.

In Part I the general data on stations are given as well as lists of publications concerning drift work during IGY/IGC. These lists are probably far from complete.

The results that are available have been obtained mainly by method D1. They are presented in Part II for stations using similarity reduction, in Part III for a station which has made the big effort of applying the correlation analysis as a routine. Further results of D1 observations, intercomparison tests and a few stations' results obtained with methods D2 and D3 are presented in Part IV. The latter contributions have the form of scientific papers.

It is the hope of all scientists concerned that future work will finally reach the objectives indicated above.

The coordination work done by Dr. B. H. BRIGGS, who was the responsible subreporter during the period of the observations is highly appreciated by all engaged in this work.

Breisach Rh. (Germany). March 1963

Karl Rawer

I. LISTING OF STATIONS AND REFERENCES

1.1. General List of Stations

Station	Country*	Geogr. lat.	Geogr. long.	Magn. inclin.	Geomagn. lat.
Ahmedabad	India	N 23°01'	E 72°36'	33°	+14.1°
Ašhabad	U. S. S. R.	N 37°56'	E 58°22'	55°	+30.6°
Bangui	Afr. Equ. Fr.	N 04°36'	E 18°35'	—16°	+05.0°
Brisbane	Australia	S 27°32'	E 152°55'	—57°	—35.8°
Cambridge	England	N 52°12'	E 0°07'	67°	+54.8°
De Bilt	Netherlands	N 52°06'	E 05°11'	67°	+53.8°
Domont	France	N 49°01'	E 02°19'	65°	+51.4°
Freiburg	Germany	N 48°03'	E 07°35'	64°	+48.4°
Gor'kij	U. S. S. R.	N 56°09'	E 44°17'	71°	+50.4°
Halley Bay	Antarctica	S 75°31'	W 26°36'	—65°	—65.8°
Har'kov	U. S. S. R.	N 50°00'	E 36°15'	66°	+45.8°
Ibadan	Nigeria	N 07°22'	E 03°58'	— 6°	+10.6°
Irkutsk	U. S. S. R.	N 52°28'	E 104°02'	72°	+41.0°
Jodrell Bank	England	N 53°14'	W 02°18'	68°	+56.3°
Johannesbg.	S. Africa	S 26°12'	E 28°02'	—62°	—26.9°
Kerguelen	Terres Austr.				
	France	S 49°18'	E 70°30'	—68°	—57.2°
Kjeller	Norway	N 59°58'	E 10°06'	73°	+60.0°
Köln	Germany	N 50°56'	E 06°57'	66°	+52.3°
Kootwijk	Netherlands	N 52°11'	E 05°46'	67°	+53.7°
Krasnaja Pahrn	U. S. S. R.	N 55°28'	E 37°19'	70°	+50.8°
Kühlungsborn	Germany	N 54°09'	E 11°46'	69°	+54.4°
Leipzig	Germany	N 51°20'	E 12°24'	67°	+51.36°
Mayaguez	Puerto Rico	N 18°30'	W 67°10'	51°	+30.0°
Moskva	U. S. S. R.	N 55°28'	E 37°19'	70°	+50.8°
Murmansk	U. S. S. R.	N 68°57'	E 33°03'	77°	+64.1°
Ottawa	Canada	N 45°24'	W 75°54'	75°	+56.9°
Rostov	U. S. S. R.	N 47°14'	E 39°39'	64°	+42.5°
Simeiz	U. S. S. R.	N 44°57'	E 34°05'	62°	+43°
Swansea	England	N 51°38'	W 04°00'	67°	+55.2°
Tamanrasset	Sahara Fr.	N 22°48'	E 05°31'	28°	+25.4°
Tomsk	U. S. S. R.	N 56°28'	E 84°58'	74°	+45.9°
Tromsø	Norway	N 69°40'	E 18°57'	78°	+67.2°
Waltair	India	N 17°34'	E 83°18'	22°	+07.4°
Wellington	New Zealand	S 31°18'	E 174°48'	—66°	—45.4°
Yamagawa	Japan	N 31°13'	E 130°38'	43°	+20.3°

* At time of observations.

1.2. Drift Data

Station	Included in part	In World Data Center CI					
		1957 J A S O N D	1958 J F M A M J J A S O N D		1959 J F M A M J J A S O N D		
Ahmedabad	—	XXXXXXX	XXXXXXX	XX			
Ašhabad	4.1		XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Bangui	2.1						
Brisbane	—	XXXXXXX	XXXXXXX	XXXXXXX			
Cambridge (England)	—	XXXXXXX	XXXXXXX	XXX	XXXXXX	XXXXXXX	
De Bilt	2.2		XXXXX	XXXXXXX			
Domont	2.3						
Freiburg	2.4	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Gor'kij	4.1	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Halley Bay	2.5; 4.7	XXXXXXX	XXXXXXX	XXXXXXX			
Ibadan	—	XX XX	XXXXX X	XXXXX X			
Irkutsk	4.1		XXX	XX XXX	XXXXX	XXXXX	
Jodrell Bank	4.8	XXXXXXX	XXXXXXX	XXXXXXX			
Johannesburg	—		XXXXXXX	XXXXXXX			
Kerguélen	2.6						
Har'kov	4.1	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Kjeller	4.6						
Köln	—	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Kootwijk	—	XXXXXXX	XXXXXXX	XXXXXXX			
Krasnaja Pahra, Moskva	4.1	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Kühlungsborn	4.5	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Mayaguez	III						
Moskva (University)	4.1	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	
Murmansk	4.1			XX	XXXXXXX	XXXXXXX	
Ottawa	2.7	XX					
Rostov	4.1			XXXXXXX	XXXXXXX	XXXXXX	
Simeiz	4.1	X	XXXXXXX	XX XX			
Swansea	—	XXXXXXX	X XX				
Tamanrasset	2.8						
Tomsk	4.1	XXXXX	XXXXXXX	XXXXXXX	X XX	XXXXXX	
Tromsö	4.6						
Waltair	—	XXXXXXX	XXXXXXX	XXXXXXX			
Wellington	4.9	XXXXXXX	XXXXXXX	XXXXXXX	XXXXX	XXXXXXX	
Yamagawa	2.9	XXXXXXX	XXXXXXX	XXXXXXX			

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STATION	TITLE	ORGANIZATION
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Kühlungsborn	Geophysikalische Messreihen	Meteorologischer und Hydrologischer Dienst der Deutschen Demokratischen Republik
Leipzig (Collm)	Geophysikalische Messreihen	Geophysikalisches Institut der Karl-Marx-Universität Leipzig
Ottawa	IGY E-layer Drift Measurements [Aug., Sept. 1957 only]	Defence Research Telecomm. Establ.
Yamagawa	IGY Data of Ionospheric Drifts at Yamagawa in Japan	National Committee for the International Geophysical Coordination, Science Council of Japan, Ueno Park, Tokyo

II. STATISTICAL TABLES: SIMILAR FADE METHOD

Introduction

THE DATA described in this part have all been obtained by **Krautkrämer's** technique of intercomparison of fadings observed at three antennae which are distant by roughly one wavelength.* The reduction was made with the method of similar fades, by which an apparent drift vector is determined as the average of several individual observations. The parameters measured are the direction Φ' and amplitude v' of the apparent drift vector. The direction is given in degrees from zero (north) over 90° (east), 180° (south) and 270° (west) to north; the amplitude in m/sec is reduced to the height of the reflecting layer by dividing by 2 the value obtained from the ground pattern.

It has been accepted as a general rule that the data should be presented as statistical distributions, not as medians only. The following tables therefore give the probability of directions and amplitudes in percentages of total time. In order to be statistically significant each sheet should cover an appropriate interval of time.

According to the density of the observations at hand, one of the following types of presentation was chosen for each station:

- Monthly tables of probability as a function of the hour: II—4 (Freiburg)
- Similar tables relative to one of the four seasons: spring, summer, fall, winter. (For the northern hemisphere: March-April, May-August, September-October, November-February. Six months later for the southern hemisphere.): II—1 (Bangui); II—2 (De Bilt); II—3 (Domont); II—5 (Halley Bay); II—6 (Kerguelen); II—8 (Tamanrasset).
- Annual tables giving separately the statistics of day and night time observations (06—18 and 18—06 LMT): II—7 (Ottawa); II—9 (Yamagawa).

In a few cases a "total count" has been indicated in order to give an idea of the total number of observation periods.

The (vertical axis) range indication means the centre of each interval used for the statistical count. The (horizontal axis) hour indication always identifies the beginning of the hour for which the tabulated probability value is valid. The probability indications in the field of each table are given as a percentage. The time system used is identified in the headline of each table. The following are given after the time system: station name, month or season, year, reflecting region.

The disposition in the annual tables (II—7 and II—9) is evident from the indications made on these pages.

* See for example: *Annals of the IGY*, Vol. III, Part III, Pergamon Press 1957.

2. 1. BANGUI Spring 1958

*Direction Φ /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	3	—	—	6	0	8	1	9	11	0	—	15	0	—	—	8	58	13	0	0	—	—	27
30°	—	32	—	—	21	0	8	13	15	0	8	—	29	0	—	—	3	27	5	0	0	—	—	36
60°	—	27	—	—	44	9	33	26	26	0	0	—	6	0	—	—	5	4	2	0	0	—	—	9
90°	—	8	—	—	18	60	44	57	39	0	23	—	0	0	—	—	33	0	0	0	0	—	—	0
120°	—	0	—	—	6	9	5	2	4	0	62	—	0	0	—	—	7	0	9	0	0	—	—	0
150°	—	0	—	—	0	5	0	0	0	11	8	—	0	0	—	—	2	0	5	0	0	—	—	0
180°	—	5	—	—	0	12	0	0	0	21	0	—	0	0	—	—	7	0	4	2	4	—	—	0
210°	—	11	—	—	0	2	0	0	0	11	0	—	0	6	—	—	15	0	4	2	4	—	—	0
240°	—	14	—	—	3	2	0	0	0	25	0	—	0	31	—	—	3	0	7	24	18	—	—	0
270°	—	0	—	—	3	0	0	0	0	4	0	—	12	38	—	—	0	4	9	63	50	—	—	0
300°	—	0	—	—	0	0	0	0	2	11	0	—	18	25	—	—	7	0	16	8	25	—	—	18
330°	—	0	—	—	0	0	3	0	6	7	0	—	21	0	—	—	11	8	27	0	0	—	—	9

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	0	—	—	0	0	0	0	0	0	0	—	0	0	—	—	0	0	0	0	0	—	—	0
15	—	0	—	—	0	0	0	0	0	0	0	—	0	0	—	—	0	0	0	2	0	—	—	0
25	—	0	—	—	3	2	10	0	0	0	0	—	0	0	—	—	16	0	0	18	0	—	—	0
35	—	0	—	—	3	9	10	0	7	0	0	—	0	0	—	—	16	0	8	6	0	—	—	0
45	—	0	—	—	3	14	38	7	17	3	38	—	3	0	—	—	9	0	8	8	0	—	—	0
55	—	0	—	—	3	60	28	21	11	10	23	—	6	0	—	—	5	4	15	8	12	—	—	0
65	—	0	—	—	9	9	13	10	6	7	15	—	24	0	—	—	13	4	14	27	16	—	—	11
75	—	3	—	—	6	5	0	15	11	3	8	—	32	13	—	—	9	0	14	2	16	—	—	0
85	—	3	—	—	6	0	0	13	22	3	15	—	21	6	—	—	9	4	24	4	12	—	—	33
95	—	6	—	—	3	0	0	10	15	21	0	—	15	13	—	—	4	4	3	4	20	—	—	11
105	—	22	—	—	15	0	0	17	4	21	0	—	0	6	—	—	9	28	7	10	8	—	—	11
115	—	33	—	—	35	0	0	3	7	24	0	—	0	50	—	—	4	44	3	2	8	—	—	33
≥	—	33	—	—	15	0	0	3	0	7	0	—	0	13	—	—	7	12	3	8	8	—	—	0

BANGUI Summer 1958

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	15	8	—	0	21	15	—	0	2	9	0	—	11	0	—	9	0	5	4	9	4	18	—	0
30°	3	4	—	0	48	41	—	0	22	0	0	—	11	0	—	4	6	3	9	3	6	0	—	0
60°	12	0	—	15	28	15	—	21	10	9	12	—	0	0	—	7	8	8	17	5	4	0	—	0
90°	6	0	—	23	3	2	—	33	43	52	27	—	23	0	—	36	25	7	21	4	2	0	—	0
120°	9	0	—	15	0	0	—	13	1	0	0	—	6	0	—	16	4	0	17	1	0	0	—	0
150°	3	0	—	8	0	0	—	8	1	0	0	—	11	0	—	0	4	0	6	0	0	9	—	0
180°	0	0	—	8	0	2	—	13	2	0	4	—	3	0	—	0	6	0	4	1	0	0	—	5
210°	0	0	—	15	0	7	—	13	1	0	5	—	9	0	—	0	8	0	4	1	4	0	—	13
240°	9	2	—	0	0	9	—	0	0	0	11	—	3	0	—	0	17	10	2	15	6	0	—	18
270°	27	33	—	15	0	4	—	0	12	4	12	—	6	25	—	0	10	35	2	39	37	27	—	8
300°	9	45	—	0	0	2	—	0	6	7	19	—	11	63	—	4	9	25	6	20	22	36	—	31
330°	6	8	—	0	0	2	—	0	0	20	9	—	6	13	—	24	3	7	6	3	14	9	—	26

Velocity v' /ms⁻¹/Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	—	0	0	2	—	0	0	0	0	—	0	0	—	0	0	0	0	0	0	0	—	0
15	0	0	—	0	0	0	—	0	1	0	0	—	0	0	—	0	0	5	0	0	0	0	—	0
25	0	0	—	0	0	2	—	0	9	18	0	—	6	0	—	0	0	13	2	0	0	0	—	0
35	3	2	—	0	0	5	—	0	7	9	3	—	26	0	—	0	1	12	28	1	10	0	—	0
45	9	6	—	8	0	2	—	17	8	11	7	—	17	0	—	7	8	7	17	14	8	0	—	3
55	15	20	—	0	0	5	—	8	10	24	9	—	26	0	—	33	17	12	13	19	12	0	—	3
65	12	6	—	15	3	16	—	21	12	18	15	—	6	0	—	30	21	20	9	24	6	18	—	5
75	15	39	—	8	7	7	—	13	18	2	24	—	9	0	—	24	21	12	4	11	14	18	—	10
85	3	18	—	0	7	7	—	13	13	9	15	—	6	0	—	0	22	8	6	21	12	36	—	10
95	3	8	—	0	0	18	—	13	13	4	12	—	6	13	—	0	6	2	13	7	22	9	—	13
105	12	2	—	8	14	25	—	4	8	2	8	—	0	0	—	2	1	5	4	2	2	9	—	33
115	6	0	—	0	45	11	—	8	1	0	3	—	0	13	—	0	4	5	4	0	2	9	—	21
≥																								
120	21	0	—	61	24	0	—	4	0	2	3	—	0	75	—	4	0	0	0	0	10	0	—	3

BANGUI FALL 1958

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	0	0	30	9	13	13	—	—	0	0	0	13	4	1	0	0	0	0
30°	—	—	—	—	—	—	0	0	14	21	17	0	—	—	0	0	0	18	11	0	0	0	0	0
60°	—	—	—	—	—	—	0	0	18	12	38	13	—	—	0	6	6	34	2	0	0	0	0	6
90°	—	—	—	—	—	—	23	33	27	23	17	63	—	—	0	17	9	6	0	0	0	0	0	30
120°	—	—	—	—	—	—	46	58	0	2	0	0	—	—	0	10	6	0	0	0	0	0	0	0
150°	—	—	—	—	—	—	23	8	0	9	0	0	—	—	0	2	4	0	0	0	0	0	0	2
180°	—	—	—	—	—	—	8	0	0	2	0	0	—	—	0	5	0	0	0	0	0	0	0	0
210°	—	—	—	—	—	—	0	0	0	4	0	0	—	—	10	3	0	0	0	4	0	20	9	4
240°	—	—	—	—	—	—	0	0	0	4	0	0	—	—	48	10	0	8	9	25	32	10	27	12
270°	—	—	—	—	—	—	0	0	9	0	0	0	—	—	43	14	5	19	31	41	42	20	55	20
300°	—	—	—	—	—	—	0	0	2	5	2	0	—	—	0	22	23	2	24	19	21	30	9	24
330°	—	—	—	—	—	—	0	0	0	11	12	13	—	—	0	11	48	0	19	9	5	20	0	2

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	0	0	0	0	0	0	—	—	0	0	0	0	0	0	0	0	0	0
15	—	—	—	—	—	—	0	0	0	0	0	0	—	—	0	0	3	0	0	0	0	0	0	0
25	—	—	—	—	—	—	0	0	0	0	2	0	—	—	0	0	3	6	12	4	0	8	0	4
35	—	—	—	—	—	—	0	0	0	7	7	0	—	—	0	8	5	2	33	4	0	0	0	6
45	—	—	—	—	—	—	7	0	0	7	17	0	—	—	0	22	5	11	12	18	0	17	0	10
55	—	—	—	—	—	—	7	17	2	14	13	0	—	—	0	5	8	5	9	9	11	17	0	4
65	—	—	—	—	—	—	36	17	2	5	13	0	—	—	0	2	9	6	14	18	11	17	9	8
75	—	—	—	—	—	—	29	0	7	9	10	13	—	—	10	2	17	6	5	25	21	25	9	8
85	—	—	—	—	—	—	14	25	16	13	9	38	—	—	5	0	14	6	7	12	21	8	27	10
95	—	—	—	—	—	—	0	17	16	16	9	25	—	—	14	6	5	18	2	6	21	0	27	20
105	—	—	—	—	—	—	7	8	45	16	6	13	—	—	48	22	14	29	5	1	16	0	27	18
115	—	—	—	—	—	—	0	17	9	11	11	13	—	—	24	29	18	10	0	3	0	8	0	12
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	0	0	2	2	2	0	—	—	0	5	0	0	0	0	0	0	0	0

BANGUI WINTER 1958

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	0	0	0	—	—
30°	—	—	—	—	—	—	—	0	8	—	—	—	0	—	—	31	0	—	0	0	0	0	—	—
60°	—	—	—	—	—	—	—	0	17	—	—	—	15	—	—	69	0	—	0	0	0	0	—	—
90°	—	—	—	—	—	—	—	0	42	—	—	—	31	—	—	0	0	—	0	0	0	22	—	—
120°	—	—	—	—	—	—	—	0	33	—	—	—	31	—	—	0	0	—	0	0	0	56	—	—
150°	—	—	—	—	—	—	—	0	0	—	—	—	23	—	—	0	20	—	0	0	0	17	—	—
180°	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	40	—	0	0	0	6	—	—
210°	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	27	—	0	0	17	0	—	—
240°	—	—	—	—	—	—	—	8	0	—	—	—	0	—	—	0	7	—	13	13	8	0	—	—
270°	—	—	—	—	—	—	—	83	0	—	—	—	0	—	—	0	0	—	39	77	75	0	—	—
300°	—	—	—	—	—	—	—	8	0	—	—	—	0	—	—	0	7	—	39	10	0	0	—	—
330°	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	9	0	0	0	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	0	0	0	—	—
15	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	0	0	6	—	—
25	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	13	0	0	—	—
35	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	37	0	6	—	—
45	—	—	—	—	—	—	—	17	0	—	—	—	0	—	—	0	0	—	4	3	17	0	—	—
55	—	—	—	—	—	—	—	67	31	—	—	—	0	—	—	0	0	—	4	0	42	6	—	—
65	—	—	—	—	—	—	—	17	15	—	—	—	15	—	—	0	13	—	24	3	42	59	—	—
75	—	—	—	—	—	—	—	0	8	—	—	—	23	—	—	15	20	—	16	3	0	24	—	—
85	—	—	—	—	—	—	—	0	31	—	—	—	31	—	—	15	13	—	28	10	0	0	—	—
95	—	—	—	—	—	—	—	0	8	—	—	—	23	—	—	46	27	—	20	20	0	0	—	—
105	—	—	—	—	—	—	—	0	8	—	—	—	8	—	—	8	13	—	4	3	0	0	—	—
115	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	15	13	—	0	7	0	0	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	0	0	—	—	—	0	—	—	0	0	—	0	0	0	0	—	—

BANGUI SPRING 1958

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	5	8	13	0	0	0	20	—	—	—	—	—	—	—	—	—	—	26	0	0	12	3	0
30°	13	34	24	3	13	2	4	0	—	—	—	—	—	—	—	—	—	—	0	0	0	18	16	5
60°	41	40	36	43	54	58	7	20	—	—	—	—	—	—	—	—	—	—	0	0	12	6	25	31
90°	15	22	28	26	24	38	50	30	—	—	—	—	—	—	—	—	—	—	0	3	20	18	15	30
120°	4	0	1	6	6	1	21	0	—	—	—	—	—	—	—	—	—	—	2	4	1	0	3	3
150°	0	0	0	1	3	0	7	0	—	—	—	—	—	—	—	—	—	—	0	0	0	2	3	1
180°	0	0	0	0	0	0	11	0	—	—	—	—	—	—	—	—	—	—	0	0	0	4	0	0
210°	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	2	0	1	6	1	0
240°	1	0	0	0	0	0	0	10	—	—	—	—	—	—	—	—	—	—	0	15	3	24	3	1
270°	6	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	2	37	5	8	12	24
300°	9	0	0	4	0	0	0	10	—	—	—	—	—	—	—	—	—	—	0	25	45	2	14	5
330°	5	0	2	3	0	0	0	10	—	—	—	—	—	—	—	—	—	—	67	15	12	0	4	1

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	0	1	0	0	2	0
25	0	0	0	2	0	0	0	0	—	—	—	—	—	—	—	—	—	—	0	1	0	0	2	1
35	0	0	1	3	2	3	0	0	—	—	—	—	—	—	—	—	—	—	0	3	1	0	4	7
45	4	3	2	5	7	7	7	10	—	—	—	—	—	—	—	—	—	—	5	7	3	0	12	16
55	4	6	3	8	9	14	18	20	—	—	—	—	—	—	—	—	—	—	12	15	9	0	11	10
65	8	10	6	6	17	22	18	20	—	—	—	—	—	—	—	—	—	—	23	17	8	0	10	5
75	10	14	9	9	18	13	4	0	—	—	—	—	—	—	—	—	—	—	23	10	8	2	10	6
85	12	8	9	5	18	6	4	10	—	—	—	—	—	—	—	—	—	—	14	10	7	6	11	6
95	18	9	9	5	7	6	4	20	—	—	—	—	—	—	—	—	—	—	12	8	5	12	12	10
105	17	23	21	10	6	13	14	0	—	—	—	—	—	—	—	—	—	—	0	18	14	36	7	10
115	17	21	28	31	12	9	18	0	—	—	—	—	—	—	—	—	—	—	5	6	25	32	7	14
≥																								
120	10	6	11	17	4	7	14	20	—	—	—	—	—	—	—	—	—	—	7	3	20	12	13	13

BANGUI SUMMER 1958

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	3	6	1	3	1	7	8	—	—	—	—	—	—	—	—	—	—	0	2	1	0	2	10
30°	0	3	9	12	4	4	27	11	—	—	—	—	—	—	—	—	—	—	0	1	3	0	0	3
60°	17	42	39	41	32	30	21	17	—	—	—	—	—	—	—	—	—	—	0	0	6	12	0	0
90°	65	52	33	33	43	50	1	17	—	—	—	—	—	—	—	—	—	—	0	3	14	0	0	12
120°	4	0	4	10	16	1	0	3	—	—	—	—	—	—	—	—	—	—	0	4	2	0	0	1
150°	0	0	0	3	1	0	0	2	—	—	—	—	—	—	—	—	—	—	0	4	2	0	1	1
180°	0	0	0	0	0	1	1	2	—	—	—	—	—	—	—	—	—	—	0	5	8	3	7	0
210°	0	0	0	0	0	3	7	0	—	—	—	—	—	—	—	—	—	—	0	6	1	16	3	0
240°	0	0	0	0	0	1	15	2	—	—	—	—	—	—	—	—	—	—	23	28	14	25	16	0
270°	4	0	3	0	0	1	15	3	—	—	—	—	—	—	—	—	—	—	46	36	34	25	31	18
300°	11	0	4	0	1	8	1	17	—	—	—	—	—	—	—	—	—	—	23	12	10	18	29	44
330°	0	0	3	0	1	0	3	17	—	—	—	—	—	—	—	—	—	—	8	1	5	0	10	10

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0
25	1	0	0	1	0	1	0	0	—	—	—	—	—	—	—	—	—	—	0	2	2	1	0	0
35	1	0	1	0	1	2	1	0	—	—	—	—	—	—	—	—	—	—	0	0	1	3	1	0
45	10	0	3	1	2	3	9	0	—	—	—	—	—	—	—	—	—	—	0	5	4	5	2	1
55	18	0	4	6	2	10	9	8	—	—	—	—	—	—	—	—	—	—	0	15	11	9	6	4
65	26	9	6	8	5	23	16	14	—	—	—	—	—	—	—	—	—	—	0	6	10	8	10	9
75	20	27	8	9	8	17	22	11	—	—	—	—	—	—	—	—	—	—	0	12	10	10	11	4
85	2	6	16	15	14	12	18	17	—	—	—	—	—	—	—	—	—	—	0	6	12	2	4	4
95	7	24	17	17	21	10	13	17	—	—	—	—	—	—	—	—	—	—	75	9	6	8	10	19
105	7	27	21	20	30	10	9	22	—	—	—	—	—	—	—	—	—	—	17	9	15	20	14	31
115	4	3	13	14	16	13	1	10	—	—	—	—	—	—	—	—	—	—	0	19	15	14	26	26
≥																								
120	4	3	11	9	2	0	0	0	—	—	—	—	—	—	—	—	—	—	8	16	14	20	17	0

BANGUI FALL 1958

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	19	0	0	0	0	0
30°	56	5	0	0	1	0	—	—	—	—	—	—	—	—	—	—	—	23	9	1	5	0	0	0
60°	28	38	6	13	32	26	—	—	—	—	—	—	—	—	—	—	—	35	5	32	13	21	0	19
90°	11	56	74	58	61	74	—	—	—	—	—	—	—	—	—	—	—	31	3	23	11	38	0	19
120°	0	1	17	23	6	0	—	—	—	—	—	—	—	—	—	—	—	4	0	0	0	0	13	5
150°	0	0	4	5	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	5
180°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	2	0	0	0	0	3
210°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	5	0	4	3
240°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	3	3	24	0	21	16
270°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	8	50	25	30	0	25	16
300°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	2	12	11	35	38	14
330°	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	8	4	0	6	0	0

Velocity v' /ms⁻¹/Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0
15	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	4	0	0	0	0
25	0	0	5	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	17	0	0	0	0
35	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	4	0	0	0	0
45	0	0	4	0	0	5	—	—	—	—	—	—	—	—	—	—	—	4	1	0	2	0	0	0
55	0	5	6	0	0	16	—	—	—	—	—	—	—	—	—	—	—	0	3	4	4	0	0	0
65	8	7	14	1	0	35	—	—	—	—	—	—	—	—	—	—	—	4	5	9	4	3	0	0
75	17	9	12	12	7	44	—	—	—	—	—	—	—	—	—	—	—	4	14	12	6	18	17	6
85	14	6	10	16	7	0	—	—	—	—	—	—	—	—	—	—	—	8	12	7	8	18	26	0
95	11	13	19	18	16	0	—	—	—	—	—	—	—	—	—	—	—	15	7	17	16	38	43	34
105	33	25	19	30	30	0	—	—	—	—	—	—	—	—	—	—	—	38	8	16	30	12	13	9
115	8	27	4	18	37	0	—	—	—	—	—	—	—	—	—	—	—	27	30	4	17	12	0	6
≥																								
120	8	8	5	5	2	0	—	—	—	—	—	—	—	—	—	—	—	0	20	5	13	0	0	46

BANGUI WINTER 1958

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	0	0	—	—	—
30°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	0	0	—	—	—
60°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	3	6	—	—	—
90°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	76	48	—	—	—
120°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	1	24	—	—	—
150°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	0	0	—	—	—
180°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	1	0	—	—	—
210°	—	—	—	—	—	—	—	—	25	—	—	—	—	—	0	—	—	0	—	0	1	—	—	—
240°	—	—	—	—	—	—	—	—	42	—	—	—	—	—	0	—	—	0	—	0	3	—	—	—
270°	—	—	—	—	—	—	—	—	33	—	—	—	—	—	50	—	—	36	—	16	13	—	—	—
300°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	38	—	—	36	—	3	4	—	—	—
330°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	13	—	—	27	—	0	0	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	0	0	—	—	—
15	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	0	0	—	—	—
25	—	—	—	—	—	—	—	—	0	—	—	—	—	—	11	—	—	0	—	0	0	—	—	—
35	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	3	0	—	—	—
45	—	—	—	—	—	—	—	—	0	—	—	—	—	—	11	—	—	0	—	9	0	—	—	—
55	—	—	—	—	—	—	—	—	8	—	—	—	—	—	11	—	—	0	—	9	1	—	—	—
65	—	—	—	—	—	—	—	—	25	—	—	—	—	—	22	—	—	9	—	12	2	—	—	—
75	—	—	—	—	—	—	—	—	17	—	—	—	—	—	11	—	—	9	—	13	6	—	—	—
85	—	—	—	—	—	—	—	—	25	—	—	—	—	—	11	—	—	9	—	19	14	—	—	—
95	—	—	—	—	—	—	—	—	25	—	—	—	—	—	22	—	—	0	—	10	8	—	—	—
105	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	45	—	5	10	—	—	—
115	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	27	—	8	27	—	—	—
≥	—	—	—	—	—	—	—	—	0	—	—	—	—	—	0	—	—	0	—	12	32	—	—	—

BANGUI SPRING 1959

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	0	3	0	0	—	—	—	0	0	15	0	0	0	0	—	—	—
30°	—	—	—	—	—	—	—	0	1	2	0	—	—	—	0	0	22	0	7	0	0	—	—	—
60°	—	—	—	—	—	—	—	0	3	18	0	—	—	—	0	0	7	0	25	0	0	—	—	—
90°	—	—	—	—	—	—	—	0	7	33	0	—	—	—	0	0	2	0	11	0	0	—	—	—
120°	—	—	—	—	—	—	—	0	1	8	0	—	—	—	0	0	2	0	18	0	0	—	—	—
150°	—	—	—	—	—	—	—	0	13	0	0	—	—	—	30	0	0	0	0	0	0	—	—	—
180°	—	—	—	—	—	—	—	0	3	0	0	—	—	—	70	0	2	0	0	0	0	—	—	—
210°	—	—	—	—	—	—	—	0	9	0	20	—	—	—	0	22	7	8	0	0	0	—	—	—
240°	—	—	—	—	—	—	—	8	16	4	50	—	—	—	0	11	11	58	0	10	22	—	—	—
270°	—	—	—	—	—	—	—	92	28	22	20	—	—	—	0	22	9	25	0	60	78	—	—	—
300°	—	—	—	—	—	—	—	0	13	10	10	—	—	—	0	33	15	8	14	30	0	—	—	—
330°	—	—	—	—	—	—	—	0	0	2	0	—	—	—	0	11	9	0	25	0	0	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	0	0	0	0	—	—	—	0	0	0	0	0	0	0	—	—	—
15	—	—	—	—	—	—	—	0	0	0	0	—	—	—	0	0	0	0	0	0	0	—	—	—
25	—	—	—	—	—	—	—	0	2	0	0	—	—	—	10	0	0	0	0	0	0	—	—	—
35	—	—	—	—	—	—	—	0	5	2	0	—	—	—	0	0	0	0	0	0	0	—	—	—
45	—	—	—	—	—	—	—	0	9	0	0	—	—	—	20	0	4	8	8	0	0	—	—	—
55	—	—	—	—	—	—	—	36	3	8	10	—	—	—	40	0	11	8	21	0	0	—	—	—
65	—	—	—	—	—	—	—	36	8	4	0	—	—	—	20	0	4	0	13	0	11	—	—	—
75	—	—	—	—	—	—	—	9	8	24	0	—	—	—	10	0	4	0	8	0	0	—	—	—
85	—	—	—	—	—	—	—	9	18	8	40	—	—	—	0	11	13	8	8	0	0	—	—	—
95	—	—	—	—	—	—	—	9	17	10	20	—	—	—	0	0	20	25	17	15	0	—	—	—
105	—	—	—	—	—	—	—	0	15	22	20	—	—	—	0	11	15	25	13	25	33	—	—	—
115	—	—	—	—	—	—	—	0	14	16	10	—	—	—	0	22	13	25	13	35	56	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	0	3	4	0	—	—	—	0	56	15	0	0	25	0	—	—	—

BANGUI SUMMER 1959

 Direction Φ' /Hour U. T. + 1 h

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	5	8	0	0	0	—	—	—
30°	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	4	2	4	0	0	—	—	—
60°	—	—	—	—	—	—	—	—	22	—	0	—	—	—	—	6	7	20	4	0	0	—	—	—
90°	—	—	—	—	—	—	—	—	56	—	0	—	—	—	—	63	2	12	0	0	0	—	—	—
120°	—	—	—	—	—	—	—	—	3	—	0	—	—	—	—	31	14	6	4	0	0	—	—	—
150°	—	—	—	—	—	—	—	—	3	—	0	—	—	—	—	0	14	12	0	0	0	—	—	—
180°	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	4	4	0	0	0	—	—	—
210°	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	5	2	0	0	0	—	—	—
240°	—	—	—	—	—	—	—	—	0	—	12	—	—	—	—	0	7	0	4	11	0	—	—	—
270°	—	—	—	—	—	—	—	—	6	—	76	—	—	—	—	0	9	2	9	57	36	—	—	—
300°	—	—	—	—	—	—	—	—	3	—	12	—	—	—	—	0	20	27	35	29	55	—	—	—
330°	—	—	—	—	—	—	—	—	6	—	0	—	—	—	—	0	9	6	39	3	9	—	—	—

 Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	0	0	0	0	0	—	—	—
15	—	—	—	—	—	—	—	—	0	—	0	—	—	—	—	0	0	0	0	0	0	—	—	—
25	—	—	—	—	—	—	—	—	4	—	0	—	—	—	—	0	0	0	8	3	0	—	—	—
35	—	—	—	—	—	—	—	—	15	—	0	—	—	—	—	25	8	2	12	3	18	—	—	—
45	—	—	—	—	—	—	—	—	19	—	9	—	—	—	—	25	6	4	8	13	18	—	—	—
55	—	—	—	—	—	—	—	—	22	—	0	—	—	—	—	25	18	8	15	33	45	—	—	—
65	—	—	—	—	—	—	—	—	7	—	0	—	—	—	—	6	16	20	8	21	9	—	—	—
75	—	—	—	—	—	—	—	—	15	—	6	—	—	—	—	0	12	8	8	13	9	—	—	—
85	—	—	—	—	—	—	—	—	7	—	6	—	—	—	—	13	10	6	8	3	0	—	—	—
95	—	—	—	—	—	—	—	—	0	—	41	—	—	—	—	0	8	10	4	8	0	—	—	—
110	—	—	—	—	—	—	—	—	4	—	24	—	—	—	—	6	6	20	8	3	0	—	—	—
140	—	—	—	—	—	—	—	—	4	—	24	—	—	—	—	0	12	16	12	3	0	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
160	—	—	—	—	—	—	—	—	4	—	0	—	—	—	—	0	6	8	12	0	0	—	—	—

BANGUI FALL 1959

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	53	—	—	—	—	—	0	0	0	2	0	—	—	0	0	0	11	—	—	0	0	—	—	—
30°	20	—	—	—	—	—	18	0	0	10	0	—	—	0	0	0	4	—	—	0	0	—	—	—
60°	7	—	—	—	—	—	45	40	27	19	28	—	—	9	11	8	9	—	—	0	8	—	—	—
90°	7	—	—	—	—	—	36	50	64	42	31	—	—	9	78	88	12	—	—	0	0	—	—	—
120°	0	—	—	—	—	—	0	10	9	2	3	—	—	36	11	4	0	—	—	0	0	—	—	—
150°	0	—	—	—	—	—	0	0	0	2	0	—	—	36	0	0	1	—	—	3	0	—	—	—
180°	0	—	—	—	—	—	0	0	0	10	0	—	—	9	0	0	9	—	—	6	0	—	—	—
210°	0	—	—	—	—	—	0	0	0	8	22	—	—	0	0	0	22	—	—	6	0	—	—	—
240°	0	—	—	—	—	—	0	0	0	4	13	—	—	0	0	0	15	—	—	18	25	—	—	—
270°	0	—	—	—	—	—	0	0	0	2	0	—	—	0	0	0	4	—	—	42	33	—	—	—
300°	0	—	—	—	—	—	0	0	0	0	0	—	—	0	0	0	3	—	—	15	17	—	—	—
330°	13	—	—	—	—	—	0	0	0	0	3	—	—	0	0	0	9	—	—	9	17	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	—	—	—	—	—	0	0	64	0	0	—	—	0	0	0	0	—	—	0	0	—	—	—
15	0	—	—	—	—	—	0	0	27	0	0	—	—	0	0	0	0	—	—	0	0	—	—	—
25	0	—	—	—	—	—	0	0	9	0	0	—	—	18	67	32	11	—	—	3	0	—	—	—
35	0	—	—	—	—	—	0	10	0	10	6	—	—	27	28	64	19	—	—	3	0	—	—	—
45	7	—	—	—	—	—	0	40	0	13	28	—	—	0	6	4	15	—	—	15	0	—	—	—
55	7	—	—	—	—	—	0	0	0	13	22	—	—	18	0	0	16	—	—	18	0	—	—	—
65	33	—	—	—	—	—	18	20	0	15	9	—	—	0	0	0	11	—	—	12	8	—	—	—
75	20	—	—	—	—	—	18	20	0	15	3	—	—	9	0	0	7	—	—	6	8	—	—	—
85	20	—	—	—	—	—	9	10	0	15	9	—	—	18	0	0	8	—	—	9	8	—	—	—
95	0	—	—	—	—	—	18	0	0	8	9	—	—	9	0	0	7	—	—	21	25	—	—	—
105	7	—	—	—	—	—	18	0	0	6	6	—	—	0	0	0	4	—	—	6	25	—	—	—
115	7	—	—	—	—	—	18	0	0	6	6	—	—	0	0	0	1	—	—	3	25	—	—	—
≥																								
120	0	—	—	—	—	—	0	0	0	0	0	—	—	0	0	0	0	—	—	3	0	—	—	—

BANGUI WINTER 1959

*Direction Φ' /Hour U. T. + 1 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	0	0	0	12	—	—	—	—	—	—	0	9	19	0	—	—	—	—
30°	—	—	—	—	—	—	0	0	0	8	—	—	—	—	—	—	0	0	9	0	—	—	—	—
60°	—	—	—	—	—	—	6	7	9	16	—	—	—	—	—	—	6	9	0	0	—	—	—	—
90°	—	—	—	—	—	—	55	86	82	36	—	—	—	—	—	—	81	0	2	0	—	—	—	—
120°	—	—	—	—	—	—	30	7	9	8	—	—	—	—	—	—	13	0	0	0	—	—	—	—
150°	—	—	—	—	—	—	3	0	0	4	—	—	—	—	—	—	0	0	6	0	—	—	—	—
180°	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	0	0	2	0	—	—	—	—
210°	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	0	0	2	0	—	—	—	—
240°	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	0	0	42	16	—	—	—	—
270°	—	—	—	—	—	—	3	0	0	0	—	—	—	—	—	—	0	73	9	19	—	—	—	—
300°	—	—	—	—	—	—	3	0	0	0	—	—	—	—	—	—	0	9	4	47	—	—	—	—
330°	—	—	—	—	—	—	0	0	0	16	—	—	—	—	—	—	0	0	6	19	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	13	0	0	0	—	—	—	—
15	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	50	0	4	0	—	—	—	—
25	—	—	—	—	—	—	0	50	0	20	—	—	—	—	—	—	13	0	12	0	—	—	—	—
35	—	—	—	—	—	—	3	36	0	36	—	—	—	—	—	—	6	0	6	16	—	—	—	—
45	—	—	—	—	—	—	6	14	27	16	—	—	—	—	—	—	6	0	16	16	—	—	—	—
55	—	—	—	—	—	—	16	0	18	16	—	—	—	—	—	—	6	0	12	16	—	—	—	—
65	—	—	—	—	—	—	44	0	18	8	—	—	—	—	—	—	6	0	8	10	—	—	—	—
75	—	—	—	—	—	—	22	0	0	4	—	—	—	—	—	—	0	9	10	10	—	—	—	—
85	—	—	—	—	—	—	9	0	9	0	—	—	—	—	—	—	0	36	10	13	—	—	—	—
95	—	—	—	—	—	—	0	0	9	0	—	—	—	—	—	—	0	18	6	3	—	—	—	—
105	—	—	—	—	—	—	0	0	9	0	—	—	—	—	—	—	0	18	6	16	—	—	—	—
115	—	—	—	—	—	—	0	0	9	0	—	—	—	—	—	—	0	18	8	0	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	0	0	4	0	—	—	—	—

BANGUI SPRING 1959

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	0	—	—	—	—	—	—	0	—	—	—	—	—	—	7	—	11	5	0	0	0	—	—
30°	3	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	2	16	2	1	3	—	—
60°	0	20	—	—	—	—	—	—	50	—	—	—	—	—	—	0	—	2	3	2	2	19	—	—
90°	0	40	—	—	—	—	—	—	42	—	—	—	—	—	—	0	—	2	1	16	6	17	—	—
120°	0	10	—	—	—	—	—	—	8	—	—	—	—	—	—	7	—	0	4	14	0	0	—	—
150°	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	21	—	0	0	4	1	0	—	—
180°	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	36	—	4	0	0	0	0	—	—
210°	8	0	—	—	—	—	—	—	0	—	—	—	—	—	—	29	—	7	13	4	4	4	—	—
240°	47	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	11	9	10	8	3	—	—
270°	29	20	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	33	5	29	48	34	—	—
300°	11	10	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	7	15	14	27	12	—	—
330°	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	20	29	6	3	9	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	0	0	0	0	0	—	—
15	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	0	0	2	0	0	—	—
25	0	0	—	—	—	—	—	—	0	—	—	—	—	—	—	0	—	2	0	0	0	0	—	—
35	0	20	—	—	—	—	—	—	27	—	—	—	—	—	—	0	—	5	1	2	2	3	—	—
45	0	10	—	—	—	—	—	—	45	—	—	—	—	—	—	0	—	5	1	4	1	10	—	—
55	0	10	—	—	—	—	—	—	0	—	—	—	—	—	—	7	—	11	0	9	2	12	—	—
65	0	20	—	—	—	—	—	—	9	—	—	—	—	—	—	13	—	11	5	4	3	15	—	—
75	6	10	—	—	—	—	—	—	9	—	—	—	—	—	—	7	—	23	2	20	7	5	—	—
85	12	0	—	—	—	—	—	—	0	—	—	—	—	—	—	13	—	14	2	4	3	7	—	—
95	18	20	—	—	—	—	—	—	0	—	—	—	—	—	—	13	—	9	6	13	11	8	—	—
105	24	10	—	—	—	—	—	—	0	—	—	—	—	—	—	20	—	7	23	11	19	10	—	—
115	21	0	—	—	—	—	—	—	9	—	—	—	—	—	—	7	—	11	17	11	16	14	—	—
≥																								
120	18	0	—	—	—	—	—	—	0	—	—	—	—	—	—	20	—	2	41	20	36	16	—	—

BANGUI SUMMER 1959

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	2	7	—	—	—	—	—	—	—	—	—	—	14	0	1	—	20	—
30°	—	—	—	—	—	—	0	7	—	—	—	—	—	—	—	—	—	—	0	0	0	—	40	—
60°	—	—	—	—	—	—	2	20	—	—	—	—	—	—	—	—	—	—	0	0	0	—	13	—
90°	—	—	—	—	—	—	2	27	—	—	—	—	—	—	—	—	—	—	0	0	0	—	7	—
120°	—	—	—	—	—	—	12	13	—	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—
150°	—	—	—	—	—	—	0	0	—	—	—	—	—	—	—	—	—	—	0	0	1	—	0	—
180°	—	—	—	—	—	—	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—
210°	—	—	—	—	—	—	5	0	—	—	—	—	—	—	—	—	—	—	0	2	1	—	0	—
240°	—	—	—	—	—	—	2	0	—	—	—	—	—	—	—	—	—	—	4	5	10	—	0	—
270°	—	—	—	—	—	—	40	0	—	—	—	—	—	—	—	—	—	—	11	51	77	—	13	—
300°	—	—	—	—	—	—	26	27	—	—	—	—	—	—	—	—	—	—	29	38	5	—	7	—
330°	—	—	—	—	—	—	9	—	—	—	—	—	—	—	—	—	—	—	43	4	4	—	0	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—
15	—	—	—	—	—	—	2	0	—	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—
25	—	—	—	—	—	—	2	0	—	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—
35	—	—	—	—	—	—	12	13	—	—	—	—	—	—	—	—	—	—	0	6	3	—	0	—
45	—	—	—	—	—	—	7	13	—	—	—	—	—	—	—	—	—	—	7	7	1	—	0	—
55	—	—	—	—	—	—	2	7	—	—	—	—	—	—	—	—	—	—	11	20	4	—	0	—
65	—	—	—	—	—	—	12	20	—	—	—	—	—	—	—	—	—	—	11	20	8	—	0	—
75	—	—	—	—	—	—	5	7	—	—	—	—	—	—	—	—	—	—	14	13	8	—	0	—
85	—	—	—	—	—	—	2	20	—	—	—	—	—	—	—	—	—	—	11	7	6	—	0	—
95	—	—	—	—	—	—	14	0	—	—	—	—	—	—	—	—	—	—	7	7	11	—	20	—
105	—	—	—	—	—	—	12	13	—	—	—	—	—	—	—	—	—	—	14	4	30	—	33	—
115	—	—	—	—	—	—	16	7	—	—	—	—	—	—	—	—	—	—	14	9	23	—	40	—
≥ 120	—	—	—	—	—	—	14	0	—	—	—	—	—	—	—	—	—	—	11	6	8	—	7	—

BANGUI FALL 1959

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	17	0	8	0	0	0	0	—
30°	11	—	15	—	—	—	3	0	—	—	—	—	—	—	—	—	25	0	20	4	4	6	1	—
60°	63	—	85	—	—	—	38	27	—	—	—	—	—	—	—	—	50	0	17	29	21	35	19	—
90°	16	—	0	—	—	—	56	64	—	—	—	—	—	—	—	—	8	0	10	8	50	43	65	—
120°	0	—	0	—	—	—	3	9	—	—	—	—	—	—	—	—	0	67	0	0	4	16	4	—
150°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	25	3	0	6	0	0	—
180°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	8	3	0	5	0	1	—
210°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	3	3	6	0	0	—
240°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	4	7	0	0	2	—
270°	5	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	30	45	4	0	4	—
300°	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	3	4	0	0	3	—
330°	5	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	0	1	0	0	0	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	—
15	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	—
25	0	—	0	—	—	—	0	0	—	—	—	—	—	—	—	—	0	0	2	0	0	0	0	—
35	0	—	0	—	—	—	5	0	—	—	—	—	—	—	—	—	0	0	5	0	5	0	0	—
45	0	—	2	—	—	—	11	0	—	—	—	—	—	—	—	—	8	0	0	1	3	3	1	—
55	0	—	2	—	—	—	18	18	—	—	—	—	—	—	—	—	17	0	2	5	6	11	4	—
65	5	—	2	—	—	—	22	18	—	—	—	—	—	—	—	—	0	17	17	11	6	12	10	—
75	5	—	4	—	—	—	15	18	—	—	—	—	—	—	—	—	8	0	11	15	14	8	14	—
85	11	—	13	—	—	—	12	9	—	—	—	—	—	—	—	—	17	0	6	18	16	17	16	—
95	26	—	28	—	—	—	5	18	—	—	—	—	—	—	—	—	0	0	26	24	21	15	18	—
105	32	—	35	—	—	—	7	9	—	—	—	—	—	—	—	—	33	33	25	14	13	27	20	—
115	11	—	11	—	—	—	4	9	—	—	—	—	—	—	—	—	17	42	8	8	15	7	15	—
≥																								
120	11	—	2	—	—	—	0	0	—	—	—	—	—	—	—	—	0	8	0	4	1	1	2	—

BANGUI WINTER 1959

*Direction Φ' /Hour U. T. + 1 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	4	3	—	—	—	—	—	—	—	—	—	39	12	5	3	1	—	—
30°	—	—	—	—	—	—	2	3	—	—	—	—	—	—	—	—	—	14	14	2	16	5	—	—
60°	—	—	—	—	—	—	7	34	—	—	—	—	—	—	—	—	—	11	0	12	49	24	—	—
90°	—	—	—	—	—	—	25	26	—	—	—	—	—	—	—	—	—	14	0	63	29	50	—	—
120°	—	—	—	—	—	—	33	20	—	—	—	—	—	—	—	—	—	7	0	12	3	16	—	—
150°	—	—	—	—	—	—	9	3	—	—	—	—	—	—	—	—	—	0	0	2	1	3	—	—
180°	—	—	—	—	—	—	11	3	—	—	—	—	—	—	—	—	—	0	2	0	0	0	—	—
210°	—	—	—	—	—	—	3	3	—	—	—	—	—	—	—	—	—	0	2	0	0	0	—	—
240°	—	—	—	—	—	—	1	3	—	—	—	—	—	—	—	—	—	0	4	0	0	0	—	—
270°	—	—	—	—	—	—	2	3	—	—	—	—	—	—	—	—	—	0	14	0	0	0	—	—
300°	—	—	—	—	—	—	3	0	—	—	—	—	—	—	—	—	—	7	22	0	0	0	—	—
300°	—	—	—	—	—	—	1	0	—	—	—	—	—	—	—	—	—	7	31	5	0	0	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 1 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	0	0	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
15	—	—	—	—	—	—	1	0	—	—	—	—	—	—	—	—	—	0	0	0	0	1	—	—
25	—	—	—	—	—	—	6	6	—	—	—	—	—	—	—	—	—	0	0	0	0	1	—	—
35	—	—	—	—	—	—	6	6	—	—	—	—	—	—	—	—	—	0	2	4	1	3	—	—
45	—	—	—	—	—	—	4	11	—	—	—	—	—	—	—	—	—	0	5	4	5	3	—	—
55	—	—	—	—	—	—	8	11	—	—	—	—	—	—	—	—	—	0	19	14	16	5	—	—
65	—	—	—	—	—	—	5	9	—	—	—	—	—	—	—	—	—	4	17	19	16	9	—	—
75	—	—	—	—	—	—	17	17	—	—	—	—	—	—	—	—	—	7	19	14	9	8	—	—
85	—	—	—	—	—	—	11	3	—	—	—	—	—	—	—	—	—	7	17	11	7	8	—	—
95	—	—	—	—	—	—	12	6	—	—	—	—	—	—	—	—	—	25	7	7	10	12	—	—
105	—	—	—	—	—	—	19	3	—	—	—	—	—	—	—	—	—	11	10	5	19	20	—	—
115	—	—	—	—	—	—	12	9	—	—	—	—	—	—	—	—	—	11	2	14	13	23	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	1	20	—	—	—	—	—	—	—	—	—	36	2	9	5	5	—	—

Region E

[illegible]

Direction Φ' /Hour U. T.

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	23	26	3	5	5	0	6	20	4	11	25	25	—	—	—	—	—
30°	—	—	—	—	—	—	—	17	29	19	0	6	35	8	7	9	0	0	5	—	—	—	—	—
60°	—	—	—	—	—	—	—	13	3	23	3	4	6	3	0	5	5	6	8	—	—	—	—	—
90°	—	—	—	—	—	—	—	7	3	0	1	1	0	11	4	6	10	13	2	—	—	—	—	—
120°	—	—	—	—	—	—	—	20	3	3	27	4	35	8	7	8	11	12	5	—	—	—	—	—
150°	—	—	—	—	—	—	—	0	7	4	48	6	0	19	31	17	21	13	3	—	—	—	—	—
180°	—	—	—	—	—	—	—	17	0	19	12	27	0	20	18	32	5	6	2	—	—	—	—	—
210°	—	—	—	—	—	—	—	3	10	15	1	20	0	11	2	12	5	0	3	—	—	—	—	—
240°	—	—	—	—	—	—	—	0	3	2	0	2	6	0	0	1	11	0	2	—	—	—	—	—
270°	—	—	—	—	—	—	—	0	3	2	0	2	0	6	0	2	0	0	0	—	—	—	—	—
300°	—	—	—	—	—	—	—	0	0	5	0	7	6	8	2	2	0	0	3	—	—	—	—	—
330°	—	—	—	—	—	—	—	0	13	5	3	15	12	0	9	2	16	25	42	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.[illegible]

DE BILT WINTER 1958

Direction Φ' /Hour U. T.

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	0	1	3	1	1	14	14	7	10	0	—	—	—	—	—	—	—
30°	—	—	—	—	—	—	—	0	1	6	1	2	3	3	8	15	9	—	—	—	—	—	—	—
60°	—	—	—	—	—	—	—	2	11	4	2	1	4	5	8	22	0	—	—	—	—	—	—	—
90°	—	—	—	—	—	—	—	27	11	12	5	1	5	4	15	4	8	—	—	—	—	—	—	—
120°	—	—	—	—	—	—	—	23	10	10	3	4	2	1	8	6	0	—	—	—	—	—	—	—
150°	—	—	—	—	—	—	—	39	13	12	13	10	3	1	10	10	0	—	—	—	—	—	—	—
180°	—	—	—	—	—	—	—	7	25	18	13	2	2	3	5	0	—	—	—	—	—	—	—	—
210°	—	—	—	—	—	—	—	2	13	12	15	27	4	4	13	9	50	—	—	—	—	—	—	—
240°	—	—	—	—	—	—	—	0	8	10	14	17	10	16	11	3	25	—	—	—	—	—	—	—
270°	—	—	—	—	—	—	—	0	4	10	13	15	16	25	9	1	0	—	—	—	—	—	—	—
300°	—	—	—	—	—	—	—	0	2	2	12	6	16	8	5	2	8	—	—	—	—	—	—	—
330°	—	—	—	—	—	—	—	1	1	1	3	3	21	17	4	3	0	—	—	—	—	—	—	—

Velocity v' /ms⁻¹/Hour U. T.[illegible]

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	2	8	7	4	2	3	15	3	5	4	8	4	10	13	—	—	—	—	—
30°	—	—	—	—	—	8	7	13	10	5	20	11	7	12	5	13	11	14	6	—	—	—	—	—
60°	—	—	—	—	—	24	22	17	26	12	26	15	16	19	21	22	24	16	23	—	—	—	—	—
90°	—	—	—	—	—	26	31	16	26	22	17	15	17	17	23	24	20	13	16	—	—	—	—	—
120°	—	—	—	—	—	10	16	16	15	34	19	3	25	14	17	16	10	9	16	—	—	—	—	—
150°	—	—	—	—	—	6	8	10	3	8	4	1	13	3	2	4	6	12	3	—	—	—	—	—
180°	—	—	—	—	—	11	2	8	3	9	3	5	2	6	3	3	3	4	4	—	—	—	—	—
210°	—	—	—	—	—	6	0	7	2	3	2	1	4	6	6	2	4	4	8	—	—	—	—	—
240°	—	—	—	—	—	2	0	0	2	1	2	2	2	4	2	3	2	2	2	—	—	—	—	—
270°	—	—	—	—	—	1	1	1	2	0	1	6	3	1	3	2	2	1	1	—	—	—	—	—
300°	—	—	—	—	—	2	2	0	5	3	1	13	3	6	5	0	7	10	2	—	—	—	—	—
330°	—	—	—	—	—	2	3	5	2	1	2	13	5	7	9	3	7	5	6	—	—	—	—	—

[illegible]

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	0	17	5	4	6	7	27	4	8	7	6	16	—	—	—	—	—	—
30°	—	—	—	—	—	—	20	2	2	6	24	6	24	9	6	2	4	5	—	—	—	—	—	—
60°	—	—	—	—	—	—	43	9	5	6	21	13	6	5	5	20	9	37	—	—	—	—	—	—
90°	—	—	—	—	—	—	14	9	9	1	6	27	6	3	2	11	19	6	—	—	—	—	—	—
120°	—	—	—	—	—	—	10	17	6	0	2	15	6	10	13	13	13	21	—	—	—	—	—	—
150°	—	—	—	—	—	—	7	7	14	10	2	7	3	10	23	14	1	5	—	—	—	—	—	—
180°	—	—	—	—	—	—	0	7	22	17	2	17	0	14	27	22	15	0	—	—	—	—	—	—
210°	—	—	—	—	—	—	0	4	7	16	23	6	1	26	7	9	16	0	—	—	—	—	—	—
240°	—	—	—	—	—	—	0	4	14	9	10	2	0	18	3	0	13	0	—	—	—	—	—	—
270°	—	—	—	—	—	—	0	7	6	12	0	0	1	0	2	2	3	5	—	—	—	—	—	—
300°	—	—	—	—	—	—	3	4	9	13	1	0	6	0	0	0	0	0	—	—	—	—	—	—
330°	—	—	—	—	—	—	3	13	1	6	3	0	20	1	4	0	1	5	—	—	—	—	—	—

[illegible]

DE BILT WINTER 1959

Direction Φ' /Hour U. T.

Region E

[illegible]

Velocity v' /ms⁻¹/ Hour U. T.

[illegible]

2.3. DOMONT SPRING 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	—	—	0	—	5	13	6	17	—	—	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	—	—	0	—	0	7	7	11	—	—	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	—	—	4	—	2	10	22	28	—	—	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	—	—	6	—	4	11	12	44	—	—	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	—	—	11	—	0	7	13	0	—	—	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	—	—	11	—	0	4	14	0	—	—	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	—	—	11	—	1	4	12	0	—	—	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	—	—	13	—	4	3	3	0	—	—	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	—	—	26	—	16	8	1	0	—	—	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	—	—	15	—	32	4	3	0	—	—	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	—	—	4	—	22	7	3	0	—	—	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	—	—	0	—	14	21	5	0	—	—	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	—	—	0	—	0	0	0	0	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	0	—	1	0	0	0	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	0	—	5	5	1	0	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	4	—	9	11	5	5	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	6	—	9	31	8	0	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	4	—	11	8	9	10	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	12	—	10	9	4	5	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	12	—	13	8	9	15	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	8	—	11	7	5	30	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	12	—	9	10	7	10	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	6	—	6	2	9	10	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	6	—	5	6	7	10	—	—	—	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	—	—	30	—	11	4	37	5	—	—	—	—	—	—	—

DOMONT SUMMER 1957

*Direction Φ' /Hour U. T.**Region E*

%	0	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	6	1	17	4	—	0	4	0	8	13	9	37	—	—	—	—
30°	—	—	—	—	—	—	—	—	10	9	14	11	—	0	14	0	22	20	7	16	—	—	—	—
60°	—	—	—	—	—	—	—	—	19	6	23	7	—	0	8	0	32	26	7	20	—	—	—	—
90°	—	—	—	—	—	—	—	—	3	27	9	9	—	0	16	78	12	13	5	2	—	—	—	—
120°	—	—	—	—	—	—	—	—	6	16	11	4	—	0	14	22	13	5	9	0	—	—	—	—
150°	—	—	—	—	—	—	—	—	23	17	9	0	—	0	0	0	4	4	11	0	—	—	—	—
180°	—	—	—	—	—	—	—	—	6	8	11	3	—	0	0	0	2	6	0	0	—	—	—	—
210°	—	—	—	—	—	—	—	—	0	4	6	8	—	0	2	0	3	3	7	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	10	8	0	14	—	33	6	0	2	4	20	0	—	—	—	—
270°	—	—	—	—	—	—	—	—	6	4	0	9	—	67	8	0	1	0	5	0	—	—	—	—
300°	—	—	—	—	—	—	—	—	3	0	0	25	—	0	24	0	1	2	0	4	—	—	—	—
330°	—	—	—	—	—	—	—	—	6	0	0	7	—	0	4	0	2	4	20	20	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	0	0	0	0	—	0	0	0	0	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	3	0	0	0	—	0	0	0	0	0	2	0	—	—	—	—
25	—	—	—	—	—	—	—	—	3	0	6	11	—	0	2	0	2	1	13	4	—	—	—	—
35	—	—	—	—	—	—	—	—	14	3	17	10	—	0	6	0	8	4	22	6	—	—	—	—
45	—	—	—	—	—	—	—	—	10	8	11	29	—	8	19	0	9	16	11	6	—	—	—	—
55	—	—	—	—	—	—	—	—	3	13	8	26	—	15	20	0	5	15	15	6	—	—	—	—
65	—	—	—	—	—	—	—	—	10	18	17	8	—	0	15	50	15	9	13	23	—	—	—	—
75	—	—	—	—	—	—	—	—	7	11	19	6	—	38	4	20	12	4	9	8	—	—	—	—
85	—	—	—	—	—	—	—	—	3	11	6	4	—	15	13	0	6	13	2	13	—	—	—	—
95	—	—	—	—	—	—	—	—	10	13	17	4	—	0	11	0	7	7	7	6	—	—	—	—
105	—	—	—	—	—	—	—	—	10	13	0	1	—	15	9	30	6	9	4	19	—	—	—	—
115	—	—	—	—	—	—	—	—	21	8	0	0	—	8	2	0	11	14	0	8	—	—	—	—
≥	—	—	—	—	—	—	—	—	3	3	0	0	—	0	0	0	20	9	2	0	—	—	—	—
120	—	—	—	—	—	—	—	—	3	3	0	0	—	0	0	0	20	9	2	0	—	—	—	—

DOMONT FALL 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	4	1	16	8	5	2	23	0	0	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	16	2	4	5	8	13	14	7	0	0	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	0	2	9	5	13	3	10	0	0	9	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	6	2	16	5	8	7	12	17	30	22	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	6	8	4	0	4	20	5	0	10	26	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	9	17	1	0	0	14	9	0	40	4	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	13	12	1	0	3	7	3	13	20	4	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	16	13	11	0	7	3	2	10	0	17	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	16	12	20	11	19	1	0	3	0	9	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	3	8	12	5	11	9	10	3	0	4	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	16	13	12	16	8	9	10	10	0	4	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	0	8	7	37	10	9	22	13	0	0	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	1	0	1	0	4	0	0	0	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	3	4	11	5	10	3	4	0	0	0	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	18	13	19	0	6	15	5	7	0	5	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	32	12	26	16	11	18	12	7	10	23	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	15	13	6	16	8	14	4	7	0	9	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	21	8	7	11	7	6	7	10	20	5	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	0	10	4	26	6	7	5	7	30	14	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	0	4	1	11	4	6	12	20	10	41	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	3	0	3	5	7	2	16	7	0	5	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	3	13	4	5	10	9	16	23	10	0	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	0	10	8	5	8	7	11	7	10	0	—	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	6	12	8	0	22	14	5	7	10	0	—	—	—	—	—

DOMONT WINTER 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	—	0	5	—	9	0	4	—	0	0	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	—	0	3	—	5	0	0	—	0	4	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	—	0	13	—	13	5	11	—	0	0	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	—	0	8	—	6	19	37	—	7	4	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	—	11	5	—	3	30	22	—	7	12	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	—	11	8	—	9	27	7	—	15	4	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	—	19	3	—	3	11	0	—	20	20	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	—	21	8	—	8	8	0	—	3	8	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	—	21	37	—	16	0	0	—	17	0	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	—	17	8	—	16	0	11	—	3	24	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	—	0	3	—	6	0	4	—	20	20	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	—	0	0	—	7	0	4	—	10	4	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	—	0	0	—	0	0	0	—	0	0	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	0	0	—	0	0	4	—	0	0	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	0	0	—	3	3	8	—	3	0	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	0	3	—	6	3	8	—	3	4	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	7	0	—	6	14	4	—	15	8	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	11	3	—	10	8	4	—	5	8	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	27	3	—	14	16	0	—	12	21	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	16	5	—	5	14	8	—	7	21	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	2	11	—	15	22	0	—	10	13	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	9	11	—	5	8	0	—	5	8	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	9	18	—	15	14	8	—	12	4	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	20	26	—	11	0	24	—	17	4	—	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	—	0	21	—	10	0	32	—	12	8	—	—	—	—	—

DOMONT SPRING 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	2	1	—	0	9	4	9	0	0	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	3	1	2	—	0	3	8	30	6	12	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	6	2	4	—	7	24	24	26	3	4	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	6	6	4	—	0	17	26	14	9	8	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	7	18	5	—	0	5	11	4	21	20	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	10	18	13	—	5	3	16	3	15	28	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	20	18	10	—	7	16	6	1	19	24	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	23	16	19	—	26	7	2	2	16	4	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	14	11	21	—	31	0	2	1	9	0	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	8	5	16	—	17	0	1	1	1	0	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	2	2	5	—	5	3	0	4	0	0	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	0	2	0	—	2	12	2	6	0	0	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	0	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	1	0	0	0	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	1	0	0	—	0	0	1	1	0	0	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	1	1	0	—	0	0	0	1	2	0	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	4	2	2	—	2	0	2	3	5	0	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	6	6	6	—	2	0	1	3	2	4	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	8	3	11	—	0	5	3	6	8	0	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	10	10	4	—	0	2	5	4	15	8	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	10	11	10	—	2	17	3	8	14	12	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	12	19	10	—	2	10	10	16	14	8	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	16	20	14	—	12	17	15	20	21	12	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	11	21	15	—	24	18	16	18	18	31	—	—	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	21	6	29	—	55	32	42	21	3	27	—	—	—	—	—	—

DOMONT SUMMER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	63	—	—	—	—	—	—	—	—	5	8	8	0	—	—	—
30°	—	—	—	—	—	—	—	—	13	—	—	—	—	—	—	—	—	15	5	8	0	—	—	—
60°	—	—	—	—	—	—	—	—	25	—	—	—	—	—	—	—	—	21	10	75	0	—	—	—
90°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	26	0	0	6	—	—	—
120°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	18	3	0	0	—	—	—
150°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	5	5	0	0	—	—	—
180°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	3	0	6	—	—	—
210°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	3	0	17	—	—	—
240°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	3	0	22	—	—	—
270°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	3	36	0	39	—	—	—
300°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	5	15	0	0	—	—	—
330°	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	3	10	8	11	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	0	0	0	—	—	—
15	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	0	0	0	—	—	—
25	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	0	0	0	0	—	—	—
35	—	—	—	—	—	—	—	—	18	—	—	—	—	—	—	—	—	0	0	0	17	—	—	—
45	—	—	—	—	—	—	—	—	9	—	—	—	—	—	—	—	—	5	5	17	6	—	—	—
55	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	5	19	8	17	—	—	—
65	—	—	—	—	—	—	—	—	27	—	—	—	—	—	—	—	—	5	11	25	28	—	—	—
75	—	—	—	—	—	—	—	—	9	—	—	—	—	—	—	—	—	26	8	33	0	—	—	—
85	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	23	8	8	11	—	—	—
95	—	—	—	—	—	—	—	—	9	—	—	—	—	—	—	—	—	8	16	8	6	—	—	—
110	—	—	—	—	—	—	—	—	27	—	—	—	—	—	—	—	—	8	19	0	17	—	—	—
140	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	3	8	0	0	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
160	—	—	—	—	—	—	—	—	0	—	—	—	—	—	—	—	—	18	5	0	0	—	—	—

DOMONT FALL 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	2	—	—	—	—	22	0	2	14	13	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	7	—	—	—	—	56	3	9	17	9	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	14	—	—	—	—	11	7	9	6	13	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	7	—	—	—	—	11	3	11	19	10	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	18	—	—	—	—	0	24	4	6	9	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	16	—	—	—	—	0	55	16	19	9	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	5	—	—	—	—	0	7	13	6	3	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	1	—	—	—	—	0	0	23	0	2	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	8	—	—	—	—	0	0	11	0	7	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	11	—	—	—	—	0	0	4	0	6	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	6	—	—	—	—	0	0	0	11	7	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	5	—	—	—	—	0	0	0	3	10	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	—	—	—	—	0	0	0	0	0	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	—	—	—	—	0	0	0	0	3	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	—	—	—	—	0	0	4	0	8	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	0	—	—	—	—	0	0	4	0	5	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	6	—	—	—	—	0	3	9	0	11	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	2	—	—	—	—	0	3	7	8	9	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	2	—	—	—	—	0	3	2	8	7	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	5	—	—	—	—	11	3	14	19	11	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	8	—	—	—	—	11	0	11	11	11	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	12	—	—	—	—	22	3	2	8	8	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	14	—	—	—	—	11	17	23	14	9	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	25	—	—	—	—	0	52	20	11	6	—	—	—	—	—
≥ 120	—	—	—	—	—	—	—	—	—	24	—	—	—	—	45	14	5	22	9	—	—	—	—	—

DOMONT WINTER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	1	3	—	4	2	3	5	3	6	5	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	1	2	2	—	4	6	8	1	7	3	4	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	3	1	5	—	5	11	7	19	20	10	1	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	1	4	4	—	12	27	16	16	7	2	5	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	13	12	2	—	5	19	19	12	15	3	9	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	19	16	4	—	1	8	13	7	6	6	13	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	20	17	18	—	3	7	12	3	10	23	19	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	22	18	20	—	13	9	11	12	7	21	22	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	16	20	19	—	22	7	5	9	3	6	13	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	2	7	12	—	16	3	2	11	4	9	6	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	2	1	5	—	3	2	2	4	9	4	3	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	1	1	6	—	10	1	1	2	8	8	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	1	0	1	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	1	0	1	1	3	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	1	1	1	—	1	1	1	1	6	6	2	—	—	—	—
35	—	—	—	—	—	—	—	—	—	1	1	2	—	2	3	5	4	6	10	6	—	—	—	—
45	—	—	—	—	—	—	—	—	—	3	3	2	—	2	5	5	11	7	10	8	—	—	—	—
55	—	—	—	—	—	—	—	—	—	6	3	2	—	5	5	5	7	11	11	9	—	—	—	—
65	—	—	—	—	—	—	—	—	—	10	8	4	—	5	7	8	12	17	14	5	—	—	—	—
75	—	—	—	—	—	—	—	—	—	7	7	6	—	8	8	10	10	8	13	6	—	—	—	—
85	—	—	—	—	—	—	—	—	—	12	11	10	—	5	8	12	6	6	7	11	—	—	—	—
95	—	—	—	—	—	—	—	—	—	13	10	15	—	7	14	13	13	5	5	9	—	—	—	—
105	—	—	—	—	—	—	—	—	—	10	14	16	—	20	16	14	10	6	7	9	—	—	—	—
115	—	—	—	—	—	—	—	—	—	11	17	20	—	11	11	8	8	4	5	17	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	26	26	23	—	33	20	19	16	22	8	18	—	—	—	—

DOMONT SPRING 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	0	0	—	5	4	23	0	—	—	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	0	1	0	—	4	0	18	0	—	—	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	4	0	0	—	0	12	11	20	—	—	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	14	3	1	—	0	1	0	30	—	—	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	22	12	10	—	1	1	5	0	—	—	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	31	13	10	—	2	1	5	30	—	—	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	6	3	14	—	3	1	2	20	—	—	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	0	10	17	—	5	0	2	0	—	—	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	20	27	30	—	12	3	0	0	—	—	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	4	6	11	—	31	24	2	0	—	—	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	0	12	6	—	29	28	7	0	—	—	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	0	12	0	—	7	24	25	0	—	—	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	2	0	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	2	3	6	—	0	0	4	0	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	14	9	7	—	2	6	0	0	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	12	15	18	—	3	6	4	0	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	10	18	4	—	5	9	11	0	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	8	3	10	—	10	15	9	0	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	12	12	11	—	17	11	13	0	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	4	2	6	—	18	10	9	27	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	18	15	7	—	13	16	15	0	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	12	9	13	—	17	7	15	18	—	—	—	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	6	12	18	—	15	21	17	55	—	—	—	—	—	—	—

DOMONT SUMMER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	5	5	19	—	0	8	4	8	—	0	0	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	10	15	36	—	18	8	9	15	—	0	0	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	58	10	17	—	50	25	16	7	—	11	0	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	23	18	0	—	15	12	31	28	—	20	8	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	0	23	6	—	15	6	21	22	—	3	25	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	3	5	14	—	3	12	12	13	—	0	50	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	0	10	8	—	0	10	1	4	—	0	17	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	0	10	0	—	0	8	0	0	—	0	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	0	5	0	—	0	10	0	0	—	37	0	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	4	2	—	29	0	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	1	1	—	0	0	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	3	0	0	—	0	4	0	0	—	0	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	2	—	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	3	—	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	8	5	3	—	0	10	1	12	—	0	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	8	8	8	—	0	12	1	21	—	6	0	—	—	—	—
45	—	—	—	—	—	—	—	—	—	8	18	28	—	0	4	7	12	—	6	8	—	—	—	—
55	—	—	—	—	—	—	—	—	—	15	10	17	—	11	4	16	22	—	20	17	—	—	—	—
65	—	—	—	—	—	—	—	—	—	25	18	17	—	47	10	26	14	—	11	17	—	—	—	—
75	—	—	—	—	—	—	—	—	—	13	23	8	—	42	2	14	2	—	17	8	—	—	—	—
85	—	—	—	—	—	—	—	—	—	8	3	0	—	0	14	13	6	—	9	0	—	—	—	—
95	—	—	—	—	—	—	—	—	—	8	8	8	—	0	16	6	1	—	6	25	—	—	—	—
105	—	—	—	—	—	—	—	—	—	10	5	3	—	0	10	10	2	—	6	17	—	—	—	—
115	—	—	—	—	—	—	—	—	—	0	3	6	—	0	12	0	2	—	0	8	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	0	3	3	—	0	8	4	1	—	20	0	—	—	—	—

DOMONT FALL 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	3	0	4	—	2	8	12	15	75	—	0	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	9	0	15	—	7	19	26	18	13	—	6	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	5	21	7	—	4	14	26	10	13	—	6	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	8	16	13	—	3	16	14	13	0	—	16	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	13	28	11	—	6	2	12	8	0	—	56	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	12	5	17	—	2	0	0	8	0	—	16	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	9	2	11	—	2	0	0	12	0	—	0	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	9	7	7	—	1	0	0	5	0	—	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	11	16	11	—	24	2	0	5	0	—	0	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	9	2	4	—	26	12	0	3	0	—	0	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	6	2	0	—	15	18	2	0	0	—	0	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	6	0	0	—	6	7	9	2	0	—	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	—	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	—	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	4	0	4	—	2	0	2	11	0	—	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	12	23	20	—	5	1	9	23	0	—	13	—	—	—	—
45	—	—	—	—	—	—	—	—	—	17	5	24	—	16	3	19	10	6	—	13	—	—	—	—
55	—	—	—	—	—	—	—	—	—	11	8	8	—	11	9	9	11	0	—	34	—	—	—	—
65	—	—	—	—	—	—	—	—	—	15	8	14	—	7	7	11	11	19	—	16	—	—	—	—
75	—	—	—	—	—	—	—	—	—	15	3	4	—	4	29	13	15	31	—	9	—	—	—	—
85	—	—	—	—	—	—	—	—	—	11	13	2	—	8	10	8	0	25	—	13	—	—	—	—
95	—	—	—	—	—	—	—	—	—	9	5	2	—	7	5	16	7	6	—	0	—	—	—	—
105	—	—	—	—	—	—	—	—	—	5	23	0	—	15	8	6	3	0	—	3	—	—	—	—
115	—	—	—	—	—	—	—	—	—	1	5	2	—	13	14	3	2	13	—	0	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	2	8	20	—	9	13	5	7	0	—	0	—	—	—	—

DOMONT WINTER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	0	3	—	14	—	—	—	0	0	0	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	0	0	3	—	11	—	—	—	0	3	0	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	0	0	13	—	8	—	—	—	0	0	0	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	0	0	10	—	6	—	—	—	0	6	0	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	22	0	0	—	0	—	—	—	9	12	0	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	28	2	3	—	0	—	—	—	27	6	8	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	39	10	6	—	6	—	—	—	45	26	8	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	11	22	32	—	22	—	—	—	9	12	69	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	0	35	19	—	11	—	—	—	9	0	15	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	0	24	6	—	6	—	—	—	0	18	0	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	0	6	3	—	6	—	—	—	0	15	0	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	0	0	0	—	11	—	—	—	0	3	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—	—	—	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—	—	—	0	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	0	0	—	0	—	—	—	9	0	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	0	2	7	—	3	—	—	—	0	3	0	—	—	—	—
45	—	—	—	—	—	—	—	—	—	11	2	13	—	11	—	—	—	9	6	0	—	—	—	—
55	—	—	—	—	—	—	—	—	—	0	6	20	—	11	—	—	—	0	6	8	—	—	—	—
65	—	—	—	—	—	—	—	—	—	11	12	13	—	20	—	—	—	9	15	38	—	—	—	—
75	—	—	—	—	—	—	—	—	—	28	8	3	—	3	—	—	—	18	21	8	—	—	—	—
85	—	—	—	—	—	—	—	—	—	17	14	7	—	23	—	—	—	9	12	23	—	—	—	—
95	—	—	—	—	—	—	—	—	—	6	12	7	—	6	—	—	—	0	12	15	—	—	—	—
105	—	—	—	—	—	—	—	—	—	17	16	3	—	6	—	—	—	9	3	0	—	—	—	—
115	—	—	—	—	—	—	—	—	—	6	12	7	—	0	—	—	—	18	6	8	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	6	14	20	—	17	—	—	—	18	15	0	—	—	—	—

DOMONT SPRING 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	1	13	0	—	0	9	31	7	2	8	0	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	0	3	0	—	0	3	15	18	21	13	0	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	1	0	0	—	2	0	3	25	18	2	0	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	3	0	5	—	18	16	7	23	26	16	11	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	15	5	1	—	11	22	3	0	2	10	33	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	12	6	4	—	5	10	0	4	2	0	0	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	10	11	4	—	2	9	0	5	0	15	56	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	13	11	11	—	11	2	0	2	2	18	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	17	13	32	—	5	0	8	2	14	10	0	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	10	14	28	—	11	5	3	4	11	2	0	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	9	16	9	—	23	19	10	7	2	7	0	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	7	8	6	—	11	5	19	4	2	0	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	2	0	50	—	—	—	—
35	—	—	—	—	—	—	—	—	—	0	1	0	—	0	0	3	2	19	8	20	—	—	—	—
45	—	—	—	—	—	—	—	—	—	0	3	0	—	2	0	3	5	24	10	10	—	—	—	—
55	—	—	—	—	—	—	—	—	—	3	3	1	—	0	0	9	9	24	5	10	—	—	—	—
65	—	—	—	—	—	—	—	—	—	5	6	1	—	8	0	5	5	7	6	0	—	—	—	—
75	—	—	—	—	—	—	—	—	—	7	12	3	—	6	0	8	16	8	11	10	—	—	—	—
85	—	—	—	—	—	—	—	—	—	10	10	0	—	8	0	17	16	2	6	0	—	—	—	—
95	—	—	—	—	—	—	—	—	—	13	11	17	—	6	3	8	9	2	3	0	—	—	—	—
105	—	—	—	—	—	—	—	—	—	10	11	10	—	14	7	12	5	3	19	0	—	—	—	—
115	—	—	—	—	—	—	—	—	—	16	17	13	—	22	14	12	12	3	17	0	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	36	26	54	—	34	76	24	21	7	14	0	—	—	—	—

DOMONT SUMMER 1958

*Direction Φ' /Hour U. T.**Région F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	30	3	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	13	6	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	0	0	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	0	0	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	0	0	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10	0	0	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30	0	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	0	9	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	9	55	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	30	9	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	17	18	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	4	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	3	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	9	6	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	13	9	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22	22	3	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	17	9	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	17	17	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	4	11	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	44	13	11	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22	0	3	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	29	—	—	—	—
120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	29	—	—	—	—

DOMONT FALL 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	17	0	0	—	—	—
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	11	17	7	0	—	—	—
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	2	56	0	40	0	—	—	—
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	0	0	20	0	—	—	—
120°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33	6	22	3	0	0	—	—	—
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28	24	11	3	0	75	—	—	—
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	6	0	0	0	0	25	—	—
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	35	0	22	0	0	—	—	—
240°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	8	0	14	13	0	—	—	—
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	4	0	19	0	0	—	—	—
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	6	13	0	—	—	—
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	7	0	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	0	0	0	0	0	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	2	0	12	0	0	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	6	0	18	13	0	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	22	21	13	13	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	12	22	21	19	0	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	12	0	12	19	38	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	6	0	6	13	25	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	6	0	0	13	0	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16	6	11	9	0	13	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	8	22	0	0	13	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11	2	11	0	6	0	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32	24	11	0	6	0	—	—	—

DOMONT WINTER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	1	0	—	3	11	9	0	4	3	—	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	2	0	0	—	10	6	10	0	10	0	—	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	20	4	10	—	7	1	10	0	10	23	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	10	9	16	—	4	9	7	10	17	13	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	20	6	5	—	4	9	7	90	15	10	—	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	15	15	3	—	4	4	7	0	13	39	—	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	15	14	0	—	13	9	9	0	4	13	—	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	5	9	8	—	26	14	12	0	9	0	—	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	15	20	23	—	16	17	19	0	6	0	—	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	0	16	26	—	6	4	5	0	8	0	—	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	0	3	10	—	6	4	3	0	4	0	—	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	0	1	0	—	1	10	0	0	0	0	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	0	0	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	2	0	0	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	5	10	1	0	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	0	0	0	—	0	0	10	20	2	0	60	—	—	—	—
45	—	—	—	—	—	—	—	—	—	10	2	0	—	4	3	10	60	8	15	30	—	—	—	—
55	—	—	—	—	—	—	—	—	—	7	2	7	—	7	4	10	10	9	6	10	—	—	—	—
65	—	—	—	—	—	—	—	—	—	7	4	2	—	3	13	8	0	16	21	0	—	—	—	—
75	—	—	—	—	—	—	—	—	—	19	3	7	—	10	4	5	0	3	18	0	—	—	—	—
85	—	—	—	—	—	—	—	—	—	21	9	11	—	11	3	9	0	15	15	0	—	—	—	—
95	—	—	—	—	—	—	—	—	—	7	9	12	—	11	15	15	0	24	9	0	—	—	—	—
105	—	—	—	—	—	—	—	—	—	12	26	16	—	19	20	12	0	12	9	0	—	—	—	—
115	—	—	—	—	—	—	—	—	—	17	24	23	—	13	14	7	0	8	3	0	—	—	—	—
≥ 180	—	—	—	—	—	—	—	—	—	0	20	23	—	21	25	6	0	2	6	0	—	—	—	—

2.4. FREIBURG JULY 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	8	5	5	26	5	17	10	4	2	9	8	13	14	17	12	12	7	2	7	11	4	5	6
30°	0	17	10	10	25	0	17	25	13	13	21	16	18	23	25	17	28	22	12	7	13	8	2	9
60°	4	8	10	10	8	10	25	25	26	26	26	14	14	19	19	18	28	28	23	8	9	10	5	9
90°	7	0	10	10	0	25	25	15	22	22	13	11	8	8	10	9	12	15	22	10	5	5	2	3
120°	7	8	10	10	8	20	8	10	12	7	5	7	6	3	3	3	3	5	12	10	6	6	0	0
150°	11	17	10	15	17	5	0	10	3	3	5	5	7	5	0	3	2	7	7	8	9	8	7	0
180°	14	17	10	15	8	0	0	5	2	6	4	4	6	8	1	5	5	8	7	13	13	15	22	6
210°	14	17	15	5	0	5	0	0	3	7	2	7	5	5	4	6	6	3	5	13	14	23	24	18
240°	14	8	15	5	0	10	0	0	4	4	2	11	4	3	7	5	2	0	4	12	8	13	10	22
270°	14	0	5	10	0	5	0	0	4	3	3	8	4	2	5	3	0	1	4	2	3	2	5	13
300°	11	0	0	5	0	5	0	0	4	3	4	5	7	4	3	7	0	2	2	3	3	2	8	7
330°	4	0	0	0	8	10	8	0	3	4	6	4	8	6	6	12	2	2	0	7	6	4	10	7

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	0
15	0	0	0	0	0	0	0	0	2	3	3	2	4	3	0	2	0	1	6	5	0	0	0	3
25	0	0	4	0	0	10	0	5	4	3	9	6	9	11	3	4	1	3	17	7	2	3	0	6
35	4	8	8	0	0	20	6	10	8	7	10	12	15	15	10	8	6	7	12	7	9	6	6	6
45	14	26	13	8	0	10	19	10	15	21	14	19	19	12	18	17	15	17	12	7	11	3	14	6
55	21	25	21	17	0	0	19	10	12	29	18	19	16	15	21	21	23	21	20	9	7	3	14	6
65	18	8	17	8	8	0	6	10	15	19	14	12	12	16	22	14	23	17	9	15	7	8	16	6
75	14	0	4	17	17	5	0	10	23	10	14	7	8	10	16	7	16	13	6	17	7	17	18	6
85	11	0	0	33	17	15	12	10	17	6	10	5	4	4	5	8	10	9	12	11	7	18	8	6
95	7	8	8	17	17	20	26	15	4	1	4	6	3	3	1	10	5	8	6	7	13	11	3	3
110	7	17	17	0	17	15	12	15	0	0	3	7	5	3	3	7	1	4	0	5	17	6	6	6
140	4	8	8	0	16	5	0	5	0	0	1	4	3	3	1	2	0	0	0	2	11	8	6	20
≥																								
160	0	0	0	0	8	0	0	0	0	0	0	1	1	5	0	0	0	0	0	6	9	17	9	26

FREIBURG AUGUST 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	11	18	14	10	10	5	5	3	5	7	7	15	9	18	8	4	2	5	3	3	3	0	3
30°	2	6	23	12	20	15	7	7	8	18	8	8	17	15	20	26	17	14	22	9	8	7	0	2
60°	7	9	9	11	25	10	13	20	23	23	11	11	15	17	16	33	30	28	33	12	4	10	2	2
90°	8	17	0	8	10	5	17	28	31	15	10	7	11	11	10	20	23	25	18	10	11	8	8	2
120°	8	14	0	5	0	8	23	17	15	9	11	8	7	4	6	5	8	11	2	7	28	10	12	3
150°	8	8	0	8	0	10	20	5	5	11	14	16	6	7	3	0	4	3	0	12	29	20	13	8
180°	12	6	2	8	0	5	8	3	6	7	13	15	4	11	2	0	6	3	0	19	14	22	8	12
210°	17	2	9	2	0	5	0	2	4	4	8	8	3	7	2	1	4	6	0	15	3	15	15	27
240°	15	2	12	3	5	10	0	2	3	3	3	5	2	2	1	3	1	3	5	10	0	5	25	28
270°	11	5	9	6	10	7	0	3	2	2	3	3	2	2	2	3	0	1	10	3	0	0	15	8
300°	6	8	9	8	10	7	2	3	0	2	5	5	6	7	7	1	1	3	5	0	0	0	2	2
330°	4	12	9	15	10	8	5	5	0	1	7	7	12	8	13	0	2	1	0	0	0	0	0	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
15	2	4	0	0	0	0	2	2	0	1	1	2	1	3	1	0	0	0	0	0	0	0	0	0
25	4	7	0	0	0	0	5	9	3	2	5	7	6	6	4	1	1	1	5	0	0	0	0	0
35	6	4	0	6	3	3	5	14	11	9	13	13	17	11	9	6	6	6	9	0	0	0	0	0
45	13	9	15	22	11	11	15	14	20	26	22	18	26	19	21	22	16	13	7	10	6	2	8	5
55	13	20	37	29	18	15	23	12	23	28	21	18	24	23	26	29	22	17	9	21	11	7	17	11
65	10	18	29	19	21	14	13	9	17	12	10	12	14	17	18	19	15	18	14	12	14	16	13	11
75	17	9	11	12	18	14	5	9	10	6	6	7	5	9	9	13	12	19	9	12	25	21	10	20
85	17	5	6	9	11	14	5	11	5	9	8	6	2	7	5	8	12	14	9	20	24	16	18	29
95	8	4	2	3	7	8	10	11	4	6	5	6	1	3	2	2	9	7	15	11	8	12	17	17
110	2	7	0	0	7	6	12	7	5	1	3	5	1	1	3	0	5	2	11	4	0	13	12	5
140	2	9	0	0	4	6	5	2	2	0	3	4	2	0	2	0	2	2	5	4	0	7	5	2
≥																								
160	6	4	0	0	0	9	0	0	0	0	3	2	1	0	0	0	0	1	7	6	12	6	0	0

FREIBURG SEPTEMBER 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	3	7	12	3	7	10	9	5	2	1	3	12	15	16	10	12	7	10	12	2	5	5	5
30°	10	11	7	11	10	11	6	8	12	3	6	5	10	15	17	12	15	9	12	12	6	9	7	6
60°	17	14	9	10	13	13	6	10	16	6	12	8	7	9	12	13	17	12	13	11	9	10	10	8
90°	16	11	15	10	9	11	9	12	9	11	9	7	6	5	6	13	18	13	10	9	10	9	11	8
120°	7	7	15	7	6	9	8	14	8	12	8	7	8	5	3	9	10	12	10	8	10	7	8	7
150°	3	7	8	7	5	8	7	11	17	10	14	10	9	5	5	5	2	11	12	8	9	11	7	9
180°	6	9	9	6	8	6	9	4	16	10	13	11	9	6	8	5	2	9	10	10	11	16	12	16
210°	12	13	12	5	9	8	8	2	7	13	11	13	8	7	4	5	4	6	5	10	16	11	17	18
240°	12	13	8	10	9	6	10	5	3	13	10	14	7	6	2	5	5	5	3	4	15	6	11	10
270°	7	4	5	8	13	5	13	8	2	10	8	11	6	5	4	6	3	7	4	0	8	7	4	4
300°	5	3	2	6	11	8	7	8	2	7	5	7	8	9	10	8	5	5	5	5	3	6	4	3
330°	2	5	3	8	4	8	7	9	3	3	3	4	10	13	13	9	7	4	6	11	1	3	4	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	2	0	4	0	3	1	1	2	0	3	1	0	3	2	0	0	1
25	1	4	7	0	2	0	0	7	5	9	2	10	7	6	5	3	6	5	3	5	5	6	4	5
35	4	9	15	3	4	3	7	10	15	17	11	16	16	15	10	6	9	10	8	9	6	12	12	9
45	11	11	10	11	6	10	19	15	19	23	24	22	27	21	21	12	13	13	11	13	9	14	17	17
55	18	11	10	14	8	14	18	21	16	21	26	22	26	21	26	19	14	9	11	12	14	21	16	18
65	15	5	12	9	4	15	13	19	11	13	16	13	11	12	15	18	16	11	11	11	13	18	17	17
75	15	3	11	5	6	19	18	13	10	5	9	6	3	7	6	15	14	13	11	9	9	10	14	10
85	13	9	12	6	10	18	10	7	10	2	5	4	3	6	5	11	8	10	12	7	7	5	10	9
95	8	16	10	15	13	11	6	1	7	2	2	2	3	6	4	8	5	7	11	10	8	2	5	10
110	10	17	5	18	14	5	4	1	4	2	2	1	2	4	2	6	6	7	11	11	10	5	2	4
140	4	10	3	11	17	3	4	3	2	1	1	0	1	1	1	2	4	8	7	6	8	4	2	0
≥																								
160	1	5	5	8	16	2	1	1	1	0	2	0	0	0	3	0	1	6	4	3	8	3	1	0

FREIBURG OCTOBER 1957

Direction Φ' /Hour U. T.

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	15	0	0	16	—	—	0	5	1	8	2	0	1	1	6	12	9	12	4	0	8	6	0	—
30°	20	0	12	9	—	—	0	15	3	8	6	2	2	2	4	5	11	12	12	0	8	12	0	—
60°	15	0	25	0	—	—	9	30	17	7	7	7	5	3	1	2	12	10	9	0	8	6	0	—
90°	5	12	13	0	—	—	21	35	33	13	9	10	6	5	0	4	8	10	2	3	8	0	0	—
120°	0	24	0	0	—	—	16	15	21	23	16	11	8	6	2	4	5	12	4	11	12	0	0	—
150°	10	20	0	0	—	—	7	0	7	18	25	16	13	8	10	4	6	12	14	11	20	20	0	—
180°	20	12	0	9	—	—	7	0	6	8	17	19	21	13	17	12	8	8	16	7	21	36	25	—
210°	10	7	13	16	—	—	3	0	4	3	5	16	21	19	16	17	10	6	12	11	10	20	50	—
240°	0	0	25	9	—	—	3	0	2	0	2	9	10	14	12	12	8	3	9	11	0	0	25	—
270°	0	7	12	9	—	—	12	0	2	1	4	5	5	11	12	6	7	2	9	15	0	0	0	—
300°	0	12	0	16	—	—	15	0	2	4	5	3	5	12	12	8	8	5	7	20	0	0	0	—
330°	5	6	0	16	—	—	7	0	2	7	2	2	3	6	8	14	8	8	2	11	5	0	0	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	—	—	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	—
15	0	0	0	0	—	—	0	0	0	1	0	1	4	1	1	1	2	0	0	0	0	4	0	—
25	4	0	0	0	—	—	4	0	1	4	4	4	8	3	5	6	6	2	2	11	0	8	0	—
35	11	7	0	0	—	—	4	0	2	9	9	8	13	8	14	12	16	8	6	22	17	8	0	—
45	14	13	0	0	—	—	0	4	2	11	16	14	14	16	24	15	19	16	10	11	41	14	0	—
55	10	7	0	8	—	—	0	8	5	10	20	15	13	16	23	17	12	18	13	7	34	13	0	—
65	7	0	25	17	—	—	4	8	8	10	15	10	7	15	14	16	8	13	11	19	8	9	0	—
75	11	7	50	16	—	—	11	21	12	13	11	9	4	14	9	14	7	10	10	19	0	8	25	—
85	18	20	25	17	—	—	19	30	18	15	7	9	17	9	6	12	6	10	12	11	0	8	50	—
95	18	20	0	8	—	—	24	13	24	12	7	10	10	7	3	6	7	8	14	0	0	8	25	—
110	7	7	0	8	—	—	19	4	19	8	8	12	7	8	1	1	8	10	12	0	0	8	0	—
140	0	7	0	18	—	—	11	8	8	4	3	7	2	3	0	0	6	3	8	0	0	8	0	—
≥																								
160	0	12	0	8	—	—	4	4	1	3	0	1	0	0	0	0	2	2	2	0	0	4	0	—

FREIBURG NOVEMBER 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	0	8	0	0	—	5	3	5	3	0	2	3	4	8	9	8	4	6	7	0	3	3	0
30°	5	11	12	5	0	—	9	7	6	3	0	2	4	3	8	11	14	8	13	9	5	2	0	0
60°	2	16	10	15	0	—	14	4	5	2	0	1	3	2	8	10	10	14	16	9	14	10	3	0
90°	3	7	6	20	0	—	9	0	6	3	1	0	1	1	5	6	5	13	14	7	14	15	6	0
120°	7	0	4	15	0	—	5	3	11	4	1	0	0	2	3	5	7	6	8	9	7	10	3	0
150°	8	0	6	5	6	—	4	11	12	10	7	5	1	2	4	4	8	6	4	17	7	8	9	8
180°	5	4	8	5	18	—	9	30	13	21	25	20	7	6	6	3	7	8	6	16	11	15	22	25
210°	13	11	11	15	20	—	18	20	15	29	37	32	21	14	12	3	9	7	10	5	13	17	23	30
240°	20	20	14	15	18	—	18	18	11	19	22	25	29	17	13	6	11	5	7	0	13	10	16	21
270°	12	22	11	5	26	—	7	4	8	5	6	10	19	20	13	12	9	10	6	5	12	3	6	12
300°	8	9	6	0	12	—	0	0	5	0	1	2	8	19	11	18	7	12	6	9	4	2	3	4
330°	10	0	4	0	0	—	2	0	3	1	0	1	4	10	9	13	5	7	4	7	0	5	6	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	—	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
25	7	4	2	0	0	—	0	0	1	0	2	0	0	1	2	4	4	3	3	0	4	0	0	4
35	17	11	4	0	0	—	0	0	2	0	1	0	0	3	9	6	6	7	9	0	10	9	0	12
45	15	11	10	0	0	—	2	0	2	1	1	1	0	6	12	11	5	10	12	0	8	27	12	16
55	8	4	19	0	8	—	4	0	6	2	2	2	3	6	8	14	6	12	10	0	2	30	28	13
65	8	4	12	0	17	—	2	0	10	3	3	3	9	3	7	8	6	7	9	6	6	16	25	8
75	10	11	4	0	17	—	2	4	9	4	9	7	12	8	12	6	9	3	15	21	18	7	16	12
85	5	11	4	0	16	—	8	11	7	11	18	11	15	16	14	10	13	4	15	30	15	2	7	18
95	2	9	6	15	17	—	16	25	14	25	26	19	22	19	12	14	13	9	8	21	12	0	3	13
110	10	15	13	35	17	—	22	35	22	33	22	26	22	18	12	14	15	17	5	8	17	2	6	4
140	13	15	16	30	8	—	26	21	15	17	10	22	14	14	8	10	11	17	8	4	8	5	3	0
≥																								
160	5	5	10	20	0	—	18	4	12	4	5	9	3	6	4	2	11	11	6	10	0	2	0	0

FREIBURG DECEMBER 1957

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	3	0	7	0	—	12	3	4	1	6	2	4	10	11	8	9	1	4	4	2	5	0	2
30°	6	5	6	18	0	—	25	5	5	2	4	2	5	7	12	12	15	7	4	6	0	5	0	7
60°	5	7	12	18	25	—	13	7	11	5	1	3	4	7	10	15	16	11	6	8	0	5	0	8
90°	5	5	6	11	50	—	0	15	15	9	2	4	5	8	5	14	11	10	12	6	0	2	0	3
120°	6	9	0	3	25	—	0	15	12	12	3	3	7	10	8	10	6	9	15	2	2	3	4	2
150°	8	18	6	4	0	—	0	5	10	10	6	6	8	11	10	5	6	10	16	10	16	15	17	7
180°	19	18	13	7	0	—	0	3	10	13	16	13	8	8	5	4	8	12	16	26	34	30	29	15
210°	28	9	13	7	0	—	13	13	9	19	23	18	7	5	3	8	8	12	10	24	30	25	25	23
240°	17	7	19	7	0	—	25	17	9	14	19	19	9	5	6	9	5	12	4	8	9	7	13	20
270°	3	9	19	7	0	—	12	10	4	8	11	16	14	7	6	6	5	9	5	0	0	0	8	10
300°	0	7	6	7	0	—	0	5	6	5	5	10	19	11	10	4	5	5	5	2	2	0	4	3
330°	0	3	0	4	0	—	0	2	5	2	4	4	10	11	14	5	6	2	3	4	5	3	0	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	—	0	0	0	0	1	0	1	0	0	0	0	0	0	0	4	0	0	0
25	0	0	0	0	0	—	0	0	0	0	4	0	3	3	0	0	0	0	0	0	4	0	0	0
35	0	6	0	0	0	—	0	0	0	0	4	0	4	1	1	0	5	2	0	0	0	0	0	0
45	0	4	0	0	0	—	0	0	0	3	11	1	3	7	3	0	0	7	0	8	0	0	0	2
55	9	14	18	0	0	—	0	9	0	3	8	3	6	10	9	6	5	7	7	12	9	0	0	7
65	3	6	6	0	0	—	0	3	1	7	3	3	8	8	7	5	4	5	10	2	7	6	0	0
75	3	4	0	0	0	—	0	0	6	13	7	8	16	13	10	8	4	10	10	6	2	11	0	2
85	9	6	0	0	0	—	0	9	10	17	15	14	16	17	14	14	5	14	9	10	11	11	10	18
95	19	8	6	8	0	—	0	20	14	19	20	25	16	17	15	18	13	11	12	18	26	17	25	34
110	26	14	26	25	0	—	13	16	22	18	15	27	15	11	16	18	26	16	19	24	21	22	30	25
140	19	18	32	30	13	—	38	12	25	13	9	14	7	6	16	14	24	19	22	16	12	19	25	10
≥																								
160	12	20	12	37	87	—	49	31	22	7	3	5	5	7	9	17	14	9	11	4	4	14	10	2

[illegible]

FREIBURG SEPTEMBER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	9	8	2	7	2	5	4	—	—	—	—	—	—	—	—	—	—	—	25	0	12	4	3	—
30°	9	10	6	7	0	7	13	—	—	—	—	—	—	—	—	—	—	—	15	3	16	11	10	—
60°	6	5	12	2	2	6	16	—	—	—	—	—	—	—	—	—	—	—	5	8	6	13	15	—
90°	6	3	13	0	3	6	13	—	—	—	—	—	—	—	—	—	—	—	0	8	0	11	10	—
120°	3	8	13	5	3	6	4	—	—	—	—	—	—	—	—	—	—	—	0	5	0	4	3	—
150°	3	10	6	9	8	3	0	—	—	—	—	—	—	—	—	—	—	—	5	15	0	0	0	—
180°	9	13	3	11	14	5	4	—	—	—	—	—	—	—	—	—	—	—	10	24	12	11	5	—
210°	17	16	11	18	18	13	13	—	—	—	—	—	—	—	—	—	—	—	5	16	26	13	14	—
240°	20	14	14	16	18	18	16	—	—	—	—	—	—	—	—	—	—	—	0	10	16	13	16	—
270°	12	5	8	9	15	17	13	—	—	—	—	—	—	—	—	—	—	—	0	8	6	13	13	—
300°	3	3	6	9	11	10	4	—	—	—	—	—	—	—	—	—	—	—	10	3	3	7	8	—
330°	3	5	6	7	6	5	0	—	—	—	—	—	—	—	—	—	—	—	25	0	3	0	3	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	2
15	0	5	0	0	2	1	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	8
25	6	14	2	2	5	7	0	—	—	—	—	—	—	—	—	—	—	—	0	0	0	4	5	12
35	17	16	6	7	7	10	0	—	—	—	—	—	—	—	—	—	—	—	0	0	6	8	12	12
45	13	15	13	20	8	12	17	—	—	—	—	—	—	—	—	—	—	—	8	5	12	12	12	12
55	3	13	16	37	8	18	38	—	—	—	—	—	—	—	—	—	—	—	17	13	9	20	12	12
65	0	8	13	27	14	19	28	—	—	—	—	—	—	—	—	—	—	—	21	13	9	13	15	8
75	3	5	8	7	18	15	13	—	—	—	—	—	—	—	—	—	—	—	25	13	17	16	12	6
85	9	5	11	0	13	9	4	—	—	—	—	—	—	—	—	—	—	—	17	15	20	20	7	10
95	13	8	13	0	8	5	0	—	—	—	—	—	—	—	—	—	—	—	8	9	12	7	6	8
110	18	8	8	0	5	3	0	—	—	—	—	—	—	—	—	—	—	—	4	7	3	0	8	2
140	18	3	4	0	5	1	0	—	—	—	—	—	—	—	—	—	—	—	0	14	3	0	8	2
≥																								
160	0	0	6	0	7	0	0	—	—	—	—	—	—	—	—	—	—	—	0	7	9	0	3	6

FREIBURG OCTOBER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	2	2	6	0	0	3	0	0	9	2	9	0	2	7	16	5	11	3	4	4	1	1	0
30°	0	4	0	5	1	2	6	8	18	5	2	10	2	1	7	9	3	11	2	4	6	4	3	2
60°	4	2	0	4	3	4	5	25	36	3	5	7	5	2	4	7	8	8	6	15	13	12	8	7
90°	11	5	0	2	2	2	8	25	26	3	5	3	7	5	7	9	11	10	9	23	22	18	17	13
120°	13	7	0	0	1	0	12	12	12	12	18	7	13	9	11	7	14	13	11	17	16	16	15	9
150°	8	11	0	2	3	0	10	12	8	22	30	16	16	10	8	5	14	12	15	10	11	15	8	10
180°	12	16	5	3	5	0	6	12	0	16	13	18	11	9	5	2	8	8	14	7	10	14	8	14
210°	18	16	20	6	13	7	6	6	0	9	0	9	11	9	7	0	6	3	6	5	3	8	13	16
240°	14	13	31	19	21	23	17	0	0	7	2	3	16	8	8	4	3	1	5	3	2	5	15	15
270°	6	11	25	27	25	32	20	0	0	2	7	4	14	12	12	10	3	5	8	2	5	5	9	11
300°	6	6	12	18	17	23	7	0	0	3	9	7	5	20	14	13	11	9	11	4	5	2	3	3
330°	6	7	5	8	9	7	0	0	0	9	7	7	0	13	10	18	14	9	10	6	3	0	0	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	3	0	2	6	0
25	2	1	0	0	1	0	1	0	0	0	0	2	0	0	0	1	0	5	11	6	0	7	6	1
35	4	4	3	0	4	4	3	0	0	0	0	5	0	0	0	2	0	6	12	4	5	8	9	5
45	9	8	11	2	6	9	4	4	0	0	2	5	0	1	9	3	0	10	13	4	15	7	10	8
55	14	9	15	6	6	9	6	13	0	0	5	3	0	2	19	4	7	13	9	7	17	8	11	6
65	7	8	16	12	4	7	6	18	0	0	2	3	2	3	12	5	17	8	6	13	14	11	13	7
75	11	12	14	14	7	11	12	12	0	2	5	5	6	9	3	7	12	7	11	19	16	12	7	7
85	23	13	11	13	12	12	20	8	8	5	16	11	10	15	6	11	7	11	16	14	12	7	4	5
95	14	9	11	12	10	11	16	13	17	17	22	15	15	16	10	16	14	14	11	9	7	10	7	16
110	7	11	11	9	8	12	12	12	25	34	23	14	23	17	12	21	16	13	3	9	8	17	7	26
140	5	13	6	9	17	12	12	8	33	32	18	14	25	18	13	16	12	9	0	7	5	10	7	17
≥																								
160	4	12	2	23	25	13	8	12	17	10	7	23	19	19	16	14	15	2	0	5	1	1	10	2

FREIBURG NOVEMBER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	1	3	3	5	6	1	2	0	3	4	3	0	2	10	9	6	6	6	3	1	0	1	3
30°	4	0	2	5	7	7	2	3	0	4	1	3	4	2	6	7	11	6	8	5	4	1	0	1
60°	4	1	2	3	8	3	3	4	2	6	1	4	7	4	5	9	14	10	9	10	14	4	1	3
90°	3	1	2	2	3	0	3	9	10	8	3	4	4	2	5	5	11	15	16	11	21	10	7	2
120°	3	1	1	1	0	2	6	15	21	13	4	1	0	4	4	5	4	15	23	12	18	16	14	2
150°	3	2	2	0	0	5	10	13	22	12	12	6	0	10	5	7	0	8	20	15	15	21	17	5
180°	8	4	4	2	2	6	9	8	12	14	24	18	3	8	6	5	2	3	10	14	15	20	13	15
210°	15	15	10	12	10	11	10	7	9	18	24	23	14	4	8	2	8	2	2	10	8	13	13	22
240°	21	28	23	26	23	23	19	9	8	14	15	19	25	10	11	0	12	5	0	8	1	8	15	21
270°	22	28	28	30	23	24	23	13	8	4	5	13	25	22	14	7	12	10	1	5	0	5	11	13
300°	13	15	17	14	12	10	12	6	1	3	4	14	22	13	22	12	11	3	4	1	2	5	7	
330°	2	4	6	2	7	3	2	5	2	3	4	2	4	10	13	22	8	9	2	3	2	0	3	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
25	3	4	6	3	0	1	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	3	5
35	4	10	7	5	3	4	2	0	0	0	0	0	4	0	3	2	6	7	3	0	2	3	5	8
45	6	12	9	9	10	5	4	2	0	0	0	1	11	0	9	5	8	9	7	0	5	9	8	6
55	11	9	11	16	13	6	6	4	0	1	0	3	11	2	13	7	8	9	9	6	2	8	11	7
65	11	10	12	15	17	8	8	8	0	4	0	4	4	2	9	7	8	10	9	7	3	3	15	12
75	11	14	12	11	22	13	14	13	3	5	3	7	4	0	7	7	10	11	11	10	13	6	9	13
85	12	14	14	8	17	13	15	15	10	3	8	8	7	0	8	5	11	9	11	13	19	12	6	13
95	10	9	13	6	5	12	14	17	22	8	16	12	7	2	9	7	13	8	11	19	23	21	5	12
110	11	8	10	10	4	15	19	16	25	22	23	17	7	9	10	12	14	14	15	22	19	23	8	9
140	11	4	4	11	7	12	13	13	30	32	29	19	14	28	13	15	12	14	14	15	9	11	13	8
≥																								
160	9	4	1	6	3	11	5	12	10	25	21	29	31	57	19	33	8	9	7	8	5	4	16	6

FREIBURG DECEMBER 1957

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	1	4	2	2	3	2	0	2	2	0	7	7	5	8	6	7	5	3	3	0	3	2	0	1
30°	3	3	2	1	4	2	1	2	3	3	10	4	9	8	6	8	9	7	6	0	4	3	0	1
60°	4	2	1	2	5	4	2	3	10	10	7	4	16	12	9	10	11	12	11	4	6	6	1	6
90°	5	2	1	3	5	5	2	7	16	17	3	8	18	13	15	10	14	14	15	10	7	8	3	9
120°	6	2	3	3	3	3	2	10	15	15	13	10	16	12	17	12	19	16	17	13	8	8	6	7
150°	6	3	6	2	3	3	1	8	10	10	24	10	9	11	12	11	12	11	17	19	13	15	15	5
180°	10	8	8	5	4	5	0	6	8	9	13	9	3	10	6	7	7	8	13	22	19	21	23	12
210°	16	16	13	16	10	8	7	12	9	8	3	7	2	8	7	3	7	7	8	18	17	15	23	18
240°	21	23	23	24	22	19	27	23	12	8	7	5	3	5	6	3	4	7	5	9	11	9	17	16
270°	16	22	24	21	24	28	36	19	9	10	8	10	5	3	4	7	2	7	3	2	6	9	9	12
300°	11	11	13	13	13	17	19	6	4	8	3	14	8	3	6	12	5	5	1	2	3	3	3	9
330°	1	4	4	8	4	4	3	2	2	2	2	12	6	7	6	10	5	3	1	1	3	1	0	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
25	3	2	2	3	0	0	2	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	1	4
35	9	10	4	3	0	0	1	0	0	0	0	0	0	1	0	7	0	0	1	2	0	5	3	5
45	13	19	6	3	2	0	2	0	1	0	0	1	0	3	1	5	5	3	4	4	9	9	6	8
55	14	19	9	7	5	0	4	1	3	2	0	2	3	5	4	4	9	5	6	4	9	8	8	12
65	10	13	11	9	6	1	3	3	4	7	5	1	11	8	8	4	7	6	7	9	8	4	8	11
75	11	9	13	9	8	9	5	7	7	17	15	2	16	12	15	5	9	16	9	18	10	8	8	10
85	11	7	15	13	15	20	11	8	12	20	18	12	13	17	23	13	17	17	15	14	13	18	12	15
95	10	8	14	19	24	18	20	11	20	23	17	27	14	19	22	21	17	16	17	13	19	22	19	13
110	10	9	13	19	21	17	23	25	22	14	18	29	21	16	12	19	11	17	18	17	14	14	19	10
140	6	4	8	10	13	19	13	27	14	12	17	20	17	10	8	11	9	14	16	11	9	4	11	8
≥																								
160	2	0	5	3	6	16	15	18	17	5	10	6	5	9	7	7	16	6	7	8	9	3	5	3

FREIBURG JANUARY 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	4	10	5	8	4	9	0	9	4	1	2	4	6	4	14	8	5	5	4	2	1	3	6
30°	8	13	17	12	17	0	7	10	11	4	2	5	2	11	7	14	8	12	12	10	4	7	6	6
60°	4	13	19	14	17	4	9	20	9	2	5	8	6	10	9	9	12	12	13	14	6	12	8	8
90°	0	4	15	5	17	11	14	10	5	4	7	8	9	8	10	6	12	6	8	7	8	13	10	8
120°	0	0	5	5	17	14	11	0	5	10	7	6	9	7	11	7	8	6	6	6	8	10	6	3
150°	8	8	0	13	16	11	9	0	9	14	8	6	10	5	11	10	6	13	13	12	16	7	3	6
180°	21	21	8	13	8	4	7	0	11	17	14	14	13	6	9	10	8	13	11	14	18	13	16	17
210°	21	20	15	12	0	4	9	5	9	17	22	16	10	11	5	5	8	10	8	10	6	21	21	18
240°	17	13	8	11	0	7	13	15	7	13	14	9	8	12	7	3	6	6	8	7	0	13	16	14
270°	13	4	0	4	0	11	7	20	9	8	9	9	8	11	11	5	8	7	8	6	6	3	8	8
300°	4	0	0	2	0	17	0	15	9	4	7	9	10	9	11	7	8	7	5	6	18	0	3	3
330°	0	0	3	4	0	13	5	5	7	3	4	8	11	4	5	10	8	3	3	4	8	0	0	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	4	0	0	0	0	1	0	1	0	2	1	1	1	0	1	2	0	0	0
25	0	0	0	0	0	7	0	0	0	0	1	2	4	1	10	3	1	3	2	4	10	0	0	3
35	8	4	3	2	0	4	0	0	0	1	3	9	8	10	13	6	2	3	6	4	19	6	8	11
45	15	8	6	4	8	0	5	0	0	2	7	16	12	17	13	10	7	6	8	3	17	12	19	11
55	13	8	6	4	17	0	9	0	0	2	11	16	17	19	10	8	12	10	3	4	6	6	15	3
65	13	8	6	4	17	4	5	0	0	3	12	12	15	13	10	6	10	10	6	7	0	1	3	0
75	13	8	10	4	17	7	5	5	7	6	15	9	11	11	9	9	3	7	14	10	6	6	3	3
85	4	8	22	11	8	7	11	10	18	12	15	9	9	12	9	14	3	12	15	17	15	9	14	7
95	4	8	22	19	0	11	13	15	22	21	11	9	11	10	8	14	9	12	14	23	15	10	18	7
110	13	13	13	19	8	14	16	26	21	23	11	9	9	6	8	12	18	11	12	19	8	18	6	15
140	13	18	9	17	17	17	18	25	16	18	9	6	3	1	5	8	21	11	9	7	2	21	3	22
≥																								
160	4	17	3	16	8	25	18	19	16	12	4	3	0	0	3	9	13	14	11	1	0	11	11	18

FREIBURG FEBRUARY 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	4	4	9	9	7	2	3	3	0	1	2	0	2	12	21	14	7	8	0	2	2	4	12
30°	4	2	0	9	3	12	6	6	4	0	3	1	0	0	5	18	22	10	11	0	7	6	7	16
60°	6	0	2	10	0	18	15	8	4	1	1	2	0	0	1	7	22	19	12	0	7	6	17	6
90°	8	0	4	5	1	10	11	5	6	3	1	1	1	0	0	3	10	14	11	5	5	6	14	0
120°	6	2	2	2	4	1	4	3	9	9	2	0	2	1	1	6	2	7	8	13	7	8	4	0
150°	10	4	2	8	7	3	4	3	12	16	6	2	2	4	3	4	2	4	8	13	11	13	4	6
180°	14	8	7	10	8	6	4	6	14	19	17	14	9	4	8	2	4	1	11	10	16	20	7	19
210°	10	13	12	10	7	4	8	18	17	17	26	26	23	6	12	3	2	1	11	13	11	15	7	20
240°	4	15	12	10	7	7	17	20	15	15	22	24	24	21	10	2	2	4	11	14	12	10	11	9
270°	10	21	16	9	16	11	17	17	10	11	11	15	23	34	9	6	4	10	6	14	15	10	11	6
300°	17	21	23	8	22	11	8	8	4	7	7	8	13	21	18	12	6	14	0	13	7	4	7	3
330°	10	10	16	10	16	10	4	3	2	2	3	5	3	7	21	16	10	9	3	5	0	0	7	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	4	0
15	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	3	0	0	2	0	8	0
25	0	0	0	1	0	1	0	0	0	0	1	0	1	1	1	1	1	2	0	5	7	0	4	0
35	2	2	2	3	6	4	5	0	0	0	1	1	2	3	5	3	1	0	9	10	11	2	0	0
45	6	8	7	5	15	5	11	5	0	2	4	4	8	5	7	5	4	2	19	5	12	8	4	6
55	8	10	8	6	15	4	5	10	0	4	7	4	9	11	6	6	8	6	10	3	15	13	13	17
65	8	8	8	8	10	3	0	7	5	6	6	6	6	10	7	8	9	8	3	8	11	11	16	12
75	10	13	18	10	6	4	4	5	10	10	7	11	7	6	13	13	8	8	10	9	7	6	13	6
85	13	20	21	15	4	10	10	12	10	15	12	15	18	12	17	16	10	16	10	10	7	4	4	6
95	16	17	18	17	10	14	12	18	15	16	21	21	14	23	18	17	17	21	3	10	11	6	6	12
110	15	8	13	14	17	11	14	14	25	17	22	21	18	20	16	15	20	16	3	9	12	8	13	20
140	8	6	5	11	13	13	21	10	24	16	14	12	11	8	8	8	13	9	6	10	5	15	13	12
≥																								
160	14	8	0	10	4	31	18	19	11	14	5	5	3	1	2	8	8	7	27	21	0	27	4	9

FREIBURG MARCH 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0	4	5	6	5	12	3	4	1	13	5	4	4	0	2	6	2	6	11	1	4	7	0	6	0
30°	3	3	1	9	13	9	10	4	18	10	5	1	0	1	6	3	3	13	5	9	9	5	8	4
60°	6	2	4	11	8	13	14	11	16	16	6	6	3	4	4	5	1	14	14	16	11	11	11	13
90°	15	0	5	7	5	13	10	14	10	13	9	11	8	6	3	6	3	8	19	8	9	8	8	15
120°	16	5	6	4	7	8	8	11	9	9	10	12	12	9	7	6	5	5	19	4	7	7	8	8
150°	12	12	10	4	7	7	15	12	10	7	14	10	16	12	10	7	6	3	14	8	14	17	8	8
180°	15	11	12	4	7	11	15	15	8	8	15	12	18	15	11	13	7	4	5	11	17	19	3	12
210°	7	6	5	12	12	11	8	9	4	6	10	12	16	14	10	15	9	5	1	8	9	11	6	10
240°	1	9	4	22	13	9	6	6	3	4	8	10	12	10	10	14	10	5	5	4	4	11	17	10
270°	5	16	12	16	9	9	4	7	2	6	8	8	9	9	12	13	17	8	7	7	2	9	16	12
300°	9	19	19	4	3	6	3	6	1	9	6	7	5	11	13	10	20	11	6	12	4	2	6	8
330°	7	12	16	2	4	1	3	4	6	7	5	7	1	7	8	6	13	13	4	9	7	0	3	2

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
15	1	0	0	0	1	2	0	0	2	2	1	4	4	1	1	0	1	0	0	0	0	0	0	2
25	4	0	1	0	3	6	0	3	6	6	3	6	11	8	4	1	3	2	0	4	2	2	3	4
35	8	2	6	4	3	7	0	6	7	10	7	7	19	18	7	8	8	6	0	14	9	13	8	8
45	12	9	13	11	7	5	1	9	9	13	16	12	18	19	17	14	15	8	4	20	22	24	14	15
55	12	14	14	11	9	3	4	10	12	12	20	14	14	15	21	13	18	5	10	15	21	13	15	13
65	10	9	9	4	4	2	4	6	6	11	11	13	14	9	15	9	13	3	8	7	8	7	8	6
75	11	6	7	0	0	4	7	4	7	10	6	14	12	9	11	8	12	6	5	5	2	16	8	8
85	10	5	10	4	0	8	12	10	15	10	10	11	6	7	10	11	9	13	9	10	8	18	11	12
95	5	14	10	14	4	11	11	18	14	9	11	7	1	5	7	16	8	13	15	8	14	7	8	13
110	5	24	10	20	17	15	19	18	7	8	8	6	0	6	4	12	9	17	18	6	11	0	6	13
140	7	12	10	16	24	17	27	12	5	3	4	4	0	3	2	5	4	15	15	4	3	0	8	6
≥																								
160	15	5	10	16	27	20	15	4	10	6	2	1	0	0	1	3	0	12	16	7	0	0	11	0

FREIBURG APRIL 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	12	8	8	2	6	5	9	4	5	6	8	5	4	5	5	6	4	8	11	13	14	8	8
30°	5	15	5	8	11	15	11	10	9	6	5	11	8	4	7	8	14	7	15	11	20	7	4	16
60°	11	10	6	5	15	19	13	11	9	12	8	9	8	6	3	7	13	12	17	11	18	7	4	8
90°	9	5	9	5	6	9	11	15	8	13	11	7	4	8	2	4	5	11	15	11	9	4	8	0
120°	5	5	11	8	6	2	11	14	11	13	12	10	4	10	8	6	3	8	10	7	5	4	4	0
150°	9	13	13	10	17	2	12	7	10	12	14	13	10	12	15	9	5	10	6	2	7	7	8	4
180°	16	19	8	10	18	5	9	4	5	10	14	12	18	12	18	12	7	12	3	5	7	7	23	13
210°	16	10	6	10	13	9	6	2	6	5	11	9	14	10	13	13	9	7	3	11	5	7	17	13
240°	11	3	9	10	6	10	5	3	10	2	6	3	7	8	6	12	12	3	5	9	5	4	8	13
270°	9	3	8	11	4	10	5	9	12	5	3	3	7	10	8	12	13	7	7	4	2	4	8	17
300°	7	2	8	10	2	8	7	9	11	8	4	8	9	10	10	8	9	11	6	7	2	14	4	8
330°	2	3	9	5	0	5	5	7	5	9	6	7	6	6	5	4	4	8	5	11	7	21	4	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
15	0	3	1	0	0	0	1	2	3	3	0	0	0	0	2	1	3	2	1	5	7	4	0	0
25	0	2	3	0	0	0	3	8	8	8	3	3	3	4	7	6	6	5	5	14	16	7	0	0
35	0	2	1	0	5	1	5	13	11	10	11	8	8	13	14	15	9	9	14	14	19	7	8	0
45	5	5	3	0	13	5	9	21	18	16	19	13	13	20	23	23	12	13	22	16	18	14	16	8
55	9	8	7	0	13	8	12	20	22	16	18	15	17	16	27	20	10	14	15	20	11	20	13	16
65	7	10	6	0	5	5	10	8	14	8	11	10	12	7	7	12	7	9	3	9	2	18	13	8
75	5	7	4	5	3	3	7	2	3	6	7	6	8	6	5	8	9	9	3	0	3	11	12	4
85	5	3	11	15	5	7	3	5	2	10	10	8	11	7	1	6	9	12	9	2	8	4	4	13
95	9	8	14	19	11	11	7	5	6	10	9	13	10	9	1	4	10	12	11	7	11	0	4	13
110	16	17	12	17	22	11	16	4	6	7	6	15	8	11	2	3	14	8	10	9	5	0	13	4
140	19	16	17	13	18	13	16	5	3	3	3	8	7	6	1	2	8	3	6	4	0	4	13	4
≥																								
160	25	17	21	31	5	36	11	7	4	3	3	1	3	1	0	0	2	4	1	0	0	11	4	30

FREIBURG MAY 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
30°	13	6	7	8	11	6	1	7	4	5	1	3	4	6	10	7	7	6	5	6	14	10	6	4
30°	14	14	5	10	13	10	10	15	12	10	9	9	11	15	13	12	15	12	9	8	18	8	16	8
60°	13	18	7	14	11	16	27	24	20	16	20	15	15	16	19	18	17	14	13	17	11	7	16	14
90°	6	12	10	10	5	10	33	20	16	18	17	18	12	9	13	19	15	12	15	17	6	8	6	8
120°	4	7	7	4	5	5	18	12	13	15	11	12	11	5	6	13	10	11	17	8	11	12	4	4
150°	8	7	5	4	9	6	6	5	10	10	10	8	10	8	1	5	8	13	14	6	17	12	10	4
180°	11	10	12	6	7	5	2	1	6	5	6	6	8	13	2	2	6	12	6	13	8	12	10	8
210°	4	11	14	8	7	3	2	1	2	4	4	3	7	8	4	2	5	6	3	13	3	10	10	17
240°	0	8	8	6	7	8	1	2	3	3	5	7	8	3	4	2	4	3	3	4	6	3	10	17
270°	2	3	7	6	7	11	0	3	5	4	7	10	8	6	6	4	4	3	3	0	3	3	6	8
300°	11	1	10	12	9	11	0	5	5	5	7	7	5	7	11	8	5	4	6	2	0	7	4	4
330°	14	3	8	12	9	9	0	5	4	5	3	2	1	4	11	8	4	4	6	6	3	8	2	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	2	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
15	0	0	2	0	0	5	0	0	1	2	1	0	0	4	0	2	2	0	0	0	0	0	0	0
25	0	3	5	2	7	5	1	1	4	8	7	1	6	7	4	4	6	3	1	0	3	2	0	0
35	4	7	11	8	13	6	6	8	13	14	17	7	17	11	14	11	12	13	6	2	11	5	3	4
45	19	11	16	12	9	8	14	18	22	20	20	20	22	15	20	21	22	24	14	19	25	14	13	17
55	26	12	14	8	5	5	15	20	19	19	12	22	15	15	17	20	21	21	16	32	28	21	19	20
65	13	9	9	10	2	2	12	12	11	13	10	11	7	12	7	9	9	10	11	15	14	14	15	11
75	6	8	7	16	5	10	15	10	8	11	10	5	7	8	5	6	6	6	11	2	8	12	12	6
85	8	8	7	12	11	20	14	12	8	8	7	8	6	3	8	8	7	8	14	6	8	12	10	8
95	8	9	9	10	14	17	9	11	5	2	5	9	5	2	8	5	6	8	12	8	3	9	13	8
110	8	15	9	10	14	11	9	5	4	1	6	9	7	6	6	5	6	3	8	6	0	8	12	11
140	6	12	5	6	11	6	5	2	3	1	4	6	6	6	4	5	3	0	3	4	0	3	3	11
≥																								
160	2	6	6	6	9	3	0	1	1	1	1	2	2	10	7	3	0	4	4	6	0	0	0	4

FREIBURG JUNE 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	5	4	6	9	6	10	7	3	4	6	6	3	5	7	7	10	9	8	3	6	9	8	1	5
30°	4	7	6	10	11	17	15	8	12	12	10	7	10	11	12	17	17	17	11	12	14	10	4	2
60°	8	12	11	11	12	19	25	19	24	16	12	14	11	15	19	20	20	23	20	21	15	10	7	0
90°	9	12	9	6	10	12	25	23	22	17	15	16	14	11	16	13	18	20	21	18	9	6	7	0
120°	7	4	5	4	7	7	11	16	11	17	12	16	14	9	10	7	11	13	14	9	4	2	5	7
150°	7	1	5	6	5	7	3	7	6	11	11	13	12	10	6	6	6	6	8	6	8	6	10	18
180°	11	6	9	9	9	7	1	3	4	7	8	7	10	6	3	7	6	3	6	5	14	14	17	19
210°	11	10	11	9	11	6	1	3	4	5	5	6	6	2	1	4	4	1	7	2	13	16	20	16
240°	12	14	6	7	7	3	1	5	4	2	4	6	4	2	1	3	1	0	4	1	6	11	14	12
270°	11	16	6	9	7	3	3	6	3	1	5	4	5	6	5	4	1	1	2	5	2	6	7	7
300°	8	10	13	10	9	4	4	4	3	3	6	4	6	11	10	4	3	3	2	8	2	5	5	7
330°	7	4	13	10	6	5	4	3	3	3	6	4	3	10	10	5	4	5	2	7	4	6	3	7

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0
15	0	0	0	1	0	2	4	2	2	2	4	2	2	0	2	1	1	1	0	1	3	1	0	0
25	1	0	0	4	3	4	6	7	5	9	5	4	8	3	10	6	8	3	3	3	7	6	4	0
35	5	3	3	7	8	7	7	13	15	17	10	11	13	12	19	13	16	8	10	8	10	10	11	3
45	8	17	10	11	12	13	15	21	23	21	24	22	18	23	21	19	13	13	16	15	15	13	18	15
55	8	25	15	11	14	16	21	23	22	16	25	22	18	20	16	21	22	19	18	17	15	15	22	22
65	12	15	16	8	13	14	13	14	12	10	10	12	14	8	9	17	17	14	14	12	8	12	13	12
75	18	9	13	11	10	10	10	8	5	9	2	9	8	6	7	12	8	10	11	10	7	10	7	6
85	19	14	9	12	10	12	9	6	5	9	5	6	6	9	7	6	7	12	9	12	9	10	6	10
95	13	12	10	12	9	13	7	3	5	5	5	4	6	9	4	2	6	11	8	10	8	10	7	14
110	8	5	13	11	9	7	4	2	4	1	4	5	5	7	2	2	2	7	7	7	8	7	8	13
140	4	0	7	7	8	1	2	1	1	0	2	2	2	3	1	1	0	2	3	4	6	3	4	5
≥																								
160	4	0	4	5	4	0	1	0	0	0	3	0	0	0	2	0	0	0	1	1	3	3	0	0

FREIBURG JULY 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	8	7	10	9	7	4	4	5	4	4	6	2	7	8	6	4	5	3	5	6	4	4	8
30°	6	8	9	9	10	7	12	11	8	10	9	9	5	9	10	16	8	12	9	9	6	4	4	8
60°	8	8	10	5	15	11	25	22	17	16	17	9	11	11	14	23	17	20	18	15	6	7	5	8
90°	6	8	8	11	12	18	26	25	24	17	17	10	14	13	14	19	23	21	19	19	10	10	8	6
120°	8	8	7	15	6	13	14	19	17	17	13	12	11	12	12	9	16	16	15	15	15	11	13	4
150°	17	9	7	10	4	4	7	9	8	16	14	14	6	10	8	5	10	9	9	10	14	14	17	10
180°	21	9	6	7	3	4	2	2	5	9	11	12	9	6	4	7	4	5	5	6	10	13	16	15
210°	14	10	7	7	3	7	0	0	2	3	4	10	15	4	2	5	3	2	3	4	9	11	11	11
240°	5	11	10	7	9	6	2	1	1	2	2	6	12	6	1	1	2	1	3	4	6	10	4	8
270°	3	8	11	7	13	7	4	2	2	1	3	4	6	9	4	1	2	2	6	6	6	6	4	7
300°	4	6	10	6	8	9	3	2	6	2	3	4	5	7	11	4	5	3	7	4	6	4	7	7
330°	4	7	8	6	8	7	1	3	5	3	3	4	4	6	12	4	6	4	3	3	6	6	7	8

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15	0	0	0	1	1	0	1	0	3	2	0	1	1	0	1	0	1	1	2	1	5	1	0	1
25	3	3	0	3	5	1	2	2	7	8	2	5	3	1	2	2	4	4	4	1	9	3	2	3
35	11	8	5	5	9	5	3	8	12	14	7	9	12	7	5	5	9	8	8	4	10	4	9	3
45	15	13	15	11	12	16	7	16	21	23	17	13	21	16	11	10	14	16	13	11	12	12	18	5
55	10	16	17	11	15	22	13	17	22	24	23	19	20	15	15	13	14	20	15	16	15	18	17	9
65	6	10	9	10	12	14	12	10	13	12	16	15	10	9	11	12	10	11	14	12	10	12	10	9
75	8	6	7	17	6	8	19	14	7	6	7	9	9	11	12	10	9	9	14	11	4	10	9	10
85	10	7	9	14	7	9	24	13	6	7	6	6	10	13	15	9	10	14	12	11	6	9	10	10
95	10	8	9	6	10	8	14	11	4	4	8	5	5	10	11	12	12	10	8	9	8	6	9	11
110	10	11	12	6	7	10	4	7	3	0	9	8	3	10	10	14	10	5	4	10	7	7	6	14
140	9	9	10	6	3	6	1	2	2	0	4	5	3	7	5	8	5	2	3	9	4	6	3	13
≥																								
160	8	9	7	10	13	1	0	0	0	0	1	5	3	1	2	5	2	0	3	5	9	12	7	12

FREIBURG AUGUST 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	5	7	9	14	8	1	1	1	2	6	7	5	6	16	9	8	3	3	9	2	2	5	5
30°	5	10	11	6	15	8	6	7	8	5	12	3	4	7	13	18	14	13	10	9	5	4	4	5
60°	5	10	11	8	8	6	21	25	21	14	14	6	2	9	11	20	26	28	23	13	11	3	4	6
90°	10	5	7	9	3	10	25	38	27	22	13	9	4	7	5	16	27	30	26	18	14	5	5	2
120°	12	7	7	3	3	14	17	22	20	21	14	9	7	6	3	10	12	18	16	15	17	10	7	12
150°	10	13	10	2	5	12	10	6	10	15	14	11	10	9	4	6	1	5	8	11	14	20	12	18
180°	12	12	10	7	10	8	5	1	8	10	10	14	14	9	6	3	0	0	4	9	14	26	20	19
210°	12	7	10	11	8	5	3	0	4	4	6	11	11	6	5	3	0	0	1	3	11	18	20	11
240°	7	6	7	16	6	4	3	0	1	1	4	7	5	7	2	2	0	0	0	1	5	4	11	6
270°	5	7	6	12	7	7	3	0	0	2	2	5	9	12	5	3	1	0	2	3	2	2	3	5
300°	7	11	7	8	10	10	3	0	0	2	2	8	15	13	12	5	4	1	4	3	2	4	4	6
330°	8	7	7	9	11	8	3	0	0	2	3	10	14	9	18	5	7	2	3	6	3	2	5	5

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
15	1	1	0	1	0	1	1	2	0	2	3	0	1	2	1	0	1	2	0	3	1	0	0	3
25	5	4	3	7	4	5	3	6	2	5	7	1	6	4	4	3	5	5	4	8	6	0	0	7
35	10	6	12	15	8	7	1	8	5	9	7	4	12	10	8	15	10	8	11	12	12	4	1	8
45	15	13	24	15	17	8	5	16	18	15	11	13	16	17	13	12	17	16	16	16	20	14	6	12
55	16	17	22	8	22	8	11	24	27	17	15	21	13	19	16	12	21	19	16	13	19	16	8	14
65	12	15	12	7	12	5	12	17	19	10	7	13	7	11	10	8	13	10	7	9	9	7	10	12
75	11	15	7	16	5	6	20	11	9	5	4	7	9	8	9	9	11	7	8	8	7	6	18	12
85	8	11	3	16	9	10	22	8	8	5	10	13	11	10	10	12	13	9	15	9	12	11	18	11
95	4	4	1	10	9	12	12	3	7	9	14	15	9	7	9	13	6	9	13	11	9	15	15	8
110	6	4	6	4	8	13	7	3	4	11	14	10	9	4	8	10	2	10	7	8	4	15	13	7
140	7	5	7	1	5	11	5	2	1	6	7	3	6	4	6	5	1	5	3	3	1	8	7	5
≥																								
160	5	5	3	0	1	14	1	0	0	5	1	0	1	3	6	1	0	0	0	0	0	4	4	1

FREIBURG SEPTEMBER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	9	6	25	6	3	0	14	4	1	1	7	8	12	13	15	7	7	5	3	2	4	6	3
30°	0	16	13	8	20	6	0	18	6	6	2	9	6	11	13	16	7	13	7	4	5	1	3	3
60°	0	16	26	0	20	6	6	11	12	10	8	11	6	11	12	14	18	17	14	11	10	3	3	9
90°	0	6	13	0	6	6	12	8	14	12	15	9	6	8	8	8	15	16	19	11	13	7	6	12
120°	8	0	0	0	0	6	12	13	12	13	19	7	8	5	7	3	12	13	18	11	8	14	8	17
150°	17	3	0	0	6	9	12	8	12	12	12	7	10	4	6	2	5	10	13	19	7	18	14	17
180°	8	12	6	0	12	9	6	2	6	10	9	9	8	5	3	2	3	6	6	16	17	16	16	9
210°	0	17	12	0	6	17	0	0	2	12	13	9	5	2	1	1	1	3	3	7	18	16	14	9
240°	8	6	6	0	6	26	6	0	4	11	11	9	6	1	1	1	1	2	3	3	10	12	8	9
270°	25	3	0	8	12	12	20	4	8	8	4	9	9	7	5	6	7	4	3	3	7	4	8	3
300°	26	6	6	25	6	0	20	11	11	4	3	7	14	17	14	15	13	5	4	5	3	1	8	3
330°	8	6	12	34	0	0	6	11	9	1	3	7	14	17	17	17	11	4	5	7	0	4	6	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	0
15	8	3	0	0	0	0	0	0	2	3	4	2	1	1	2	1	6	4	0	3	0	1	0	3
25	33	6	0	8	0	6	0	0	10	10	16	6	3	5	11	9	12	7	3	8	5	4	0	12
35	42	13	0	17	6	17	0	2	20	18	24	10	10	15	18	20	17	10	10	12	15	14	3	23
45	17	20	6	25	19	17	6	15	24	24	22	18	21	26	19	24	20	18	20	21	23	28	17	23
55	0	10	12	33	19	12	12	23	23	23	18	24	22	19	14	20	20	21	21	24	24	24	24	12
65	0	3	20	17	12	12	6	13	12	12	10	15	10	7	8	11	9	13	13	13	17	13	11	3
75	0	9	26	0	19	12	6	8	6	4	4	7	5	6	9	8	2	10	12	7	7	11	6	3
85	0	9	12	0	19	12	12	11	3	2	2	4	6	6	10	4	2	7	11	5	2	5	14	6
95	0	6	6	0	6	9	20	8	0	1	0	4	6	6	4	1	3	4	5	3	2	0	14	3
110	0	6	12	0	0	3	26	8	0	2	0	6	8	6	1	1	5	4	2	3	3	0	8	3
140	0	6	6	0	0	0	12	6	0	1	0	3	5	3	3	1	2	1	1	1	2	0	3	6
≥																								
160	0	9	0	0	0	0	0	6	0	0	0	0	3	0	1	0	0	0	2	0	0	0	0	3

FREIBURG OCTOBER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	6	9	10	10	8	11	6	4	4	4	4	7	7	6	8	7	8	3	6	9	2	2	0
30°	0	6	8	13	8	7	6	6	4	5	7	4	5	6	8	10	6	7	3	3	9	0	9	4
60°	0	6	8	10	8	5	6	6	7	10	6	7	5	4	9	10	6	9	3	6	7	4	11	13
90°	3	6	8	9	5	7	8	3	12	11	6	7	5	4	5	5	9	8	3	8	4	8	7	13
120°	8	6	6	9	8	5	8	3	19	11	12	7	5	7	5	4	12	8	9	11	8	11	5	4
150°	8	3	8	7	8	8	6	6	14	11	16	10	10	8	8	8	9	8	17	14	12	16	7	8
180°	14	10	9	9	5	17	4	3	8	10	11	12	20	10	7	13	8	12	20	13	11	16	11	17
210°	25	27	10	10	8	17	6	3	4	7	4	14	21	12	6	12	9	15	12	10	14	11	18	8
240°	19	21	8	6	9	12	11	6	6	6	4	10	7	9	6	8	8	8	6	5	14	11	21	0
270°	8	6	8	4	8	8	12	16	10	7	12	7	1	10	11	5	8	3	7	5	7	11	9	8
300°	6	0	9	6	9	3	11	26	8	10	12	9	6	12	17	8	9	5	9	9	1	6	0	17
330°	6	3	9	7	14	3	11	16	4	8	6	9	8	11	12	9	9	9	8	10	4	4	0	8

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	3	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1	0	2	0	0
15	3	0	2	1	0	0	0	0	0	4	2	1	5	4	4	3	1	2	2	4	0	9	0	4
25	0	6	3	3	0	2	2	0	3	6	5	6	10	10	8	6	4	6	5	5	1	13	13	13
35	0	14	2	3	8	4	5	0	6	6	9	13	14	16	10	9	6	12	11	5	8	9	29	13
45	6	16	3	10	16	2	9	3	13	14	21	20	24	18	20	18	10	18	15	8	18	5	13	8
55	15	14	6	16	12	0	13	6	20	23	30	22	28	15	29	23	14	13	16	12	19	9	0	8
65	18	6	3	10	3	0	7	6	13	15	17	11	13	9	17	12	10	7	13	11	8	16	0	8
75	15	0	3	6	0	4	0	9	9	7	4	3	1	6	7	4	9	7	13	11	4	17	0	8
85	6	3	8	3	3	10	2	9	9	5	4	4	0	6	1	5	10	7	12	10	8	9	5	13
95	6	8	12	3	8	13	7	9	8	6	4	7	1	6	1	6	11	7	5	11	12	2	13	17
110	14	11	16	9	10	15	9	17	8	7	3	7	2	6	1	7	11	10	3	12	9	2	13	8
140	11	11	14	12	13	12	7	13	5	5	1	3	1	3	1	4	7	8	3	7	5	5	7	0
≥																								
160	3	11	28	24	27	38	39	28	6	1	0	3	0	0	0	2	7	2	1	3	8	2	7	0

FREIBURG NOVEMBER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	2	0	9	0	0	12	7	1	2	0	0	1	3	5	8	10	8	10	8	1	2	9	6
30°	3	4	4	12	0	0	12	7	7	3	0	0	1	3	3	6	13	5	10	9	6	4	7	6
60°	5	2	13	9	0	6	6	11	10	3	0	0	0	1	2	6	10	7	11	12	10	6	2	6
90°	10	2	13	6	0	19	0	14	8	6	1	1	1	1	2	7	6	9	6	10	10	8	2	6
120°	10	4	4	6	0	19	0	11	10	14	10	8	4	1	2	4	5	11	7	5	12	4	5	6
150°	3	12	0	3	0	6	0	7	12	22	27	20	9	5	3	6	5	8	11	5	19	8	11	12
180°	10	24	13	3	0	0	12	7	11	21	31	27	20	16	11	11	8	8	7	9	15	19	24	20
210°	23	20	24	17	0	12	26	4	10	14	21	23	28	25	21	12	9	7	3	10	8	22	20	17
240°	17	10	13	23	0	25	14	0	13	9	7	13	24	22	19	11	8	3	1	6	3	19	9	12
270°	7	10	4	9	25	13	0	7	12	4	1	4	10	14	12	11	8	5	4	5	4	8	2	6
300°	7	8	8	0	50	0	6	14	5	1	1	3	1	6	11	10	8	14	14	10	8	0	2	0
330°	3	2	4	3	25	0	12	11	1	1	1	1	1	3	9	8	10	15	16	11	4	0	7	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
15	0	0	8	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	4	1	0	0	0	0
25	2	4	8	0	0	0	0	0	0	0	0	0	1	3	2	8	4	1	7	4	0	0	0	0
35	4	13	13	0	0	0	0	4	1	0	1	1	4	6	7	15	10	5	6	8	0	4	0	0
45	8	19	18	4	0	0	6	11	3	7	6	7	11	12	16	19	13	14	13	15	7	9	0	0
55	12	15	13	7	0	0	13	11	4	14	13	11	17	16	18	18	14	20	20	19	15	7	2	3
65	8	12	4	4	0	0	6	4	6	10	10	8	10	13	13	10	10	12	13	9	14	2	5	9
75	8	13	4	4	0	0	6	4	11	9	10	10	6	9	9	7	9	10	10	3	11	9	11	9
85	12	12	8	11	0	0	12	7	12	14	15	13	11	9	8	5	10	11	11	7	7	20	21	6
95	12	6	8	14	25	12	6	14	18	15	16	19	17	12	9	4	8	10	6	8	10	20	18	12
110	12	4	8	17	50	25	13	24	24	18	16	21	17	13	11	7	7	10	4	10	19	14	16	23
140	12	2	4	17	25	13	26	17	17	11	10	10	6	6	6	5	6	6	4	9	12	11	16	23
≥																								
160	10	0	0	22	0	50	12	4	4	2	3	0	0	0	0	1	7	1	2	7	5	4	11	15

FREIBURG DECEMBER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	7	0	0	17	0	12	15	7	2	0	2	2	8	9	3	0	15	15	0	0	0	0	0
30°	19	7	0	14	5	0	6	10	7	2	2	1	1	5	9	9	5	9	10	6	0	0	7	0
60°	12	7	0	8	0	0	0	15	3	3	2	0	0	3	8	18	14	5	3	9	6	0	9	7
90°	6	7	0	11	0	0	6	15	4	5	4	2	3	7	10	15	25	7	3	12	6	0	7	11
120°	0	7	10	8	3	0	13	10	14	10	7	5	11	13	14	11	21	11	10	12	9	17	13	21
150°	6	7	10	8	10	10	6	10	10	13	10	8	17	14	14	11	8	11	14	14	22	33	23	24
180°	27	7	10	11	12	10	6	5	14	21	19	91	10	9	7	10	2	9	14	14	29	29	16	11
210°	30	11	15	6	8	5	13	0	5	23	25	28	12	7	5	5	5	7	7	9	16	13	9	4
240°	0	11	15	0	8	5	6	0	5	12	20	18	17	8	9	2	8	5	3	6	3	8	9	11
270°	0	7	10	0	8	20	6	0	9	5	6	7	16	8	9	4	4	5	3	9	3	0	7	11
300°	0	11	15	11	10	30	13	5	7	4	2	5	8	9	3	7	4	5	6	9	6	0	0	0
330°	0	11	15	23	19	20	13	15	5	0	3	3	3	9	3	5	4	11	12	0	0	0	0	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	2	1	0	1	1	0	0	2	0	0	0	0	0	0
35	0	0	0	3	0	0	0	0	1	1	2	2	2	4	5	1	2	7	1	3	0	0	0	0
45	6	0	5	6	3	5	17	0	3	4	7	5	9	8	10	7	6	16	10	6	0	0	5	0
55	12	0	10	3	5	10	33	0	1	5	10	9	12	9	11	10	8	21	15	3	0	0	11	4
65	12	4	15	3	8	10	17	20	7	5	8	10	11	13	8	7	6	13	15	6	6	13	16	14
75	19	7	20	6	13	15	0	40	14	10	9	13	14	21	10	7	7	9	20	13	13	33	20	15
85	26	18	20	15	14	20	8	25	17	16	12	18	15	17	12	13	10	9	17	9	16	29	18	11
95	19	31	20	21	14	15	17	10	21	21	19	18	14	9	12	18	15	9	11	9	22	13	9	11
110	6	25	10	21	12	10	8	5	18	21	19	16	14	8	15	19	22	7	8	16	19	8	7	19
140	0	11	0	16	13	10	0	0	13	12	10	7	8	7	10	14	17	5	3	19	9	4	9	19
≥																								
160	0	4	0	6	18	5	0	0	5	5	1	1	1	3	6	4	7	2	0	16	15	0	5	7

FREIBURG JANUARY 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	1	1	2	2	2	2	0	3	1	0	3	2	4	6	4	7	6	5	1	1	1	4	1	3
30°	2	0	4	8	2	1	1	4	1	4	4	5	6	0	6	12	5	11	6	0	4	5	3	3
60°	3	1	4	10	3	1	5	6	7	8	7	10	4	6	10	13	6	13	13	3	10	5	6	5
90°	3	4	4	5	3	3	9	6	12	12	7	10	4	12	6	12	8	12	15	10	13	4	6	6
120°	2	4	2	2	1	4	8	7	12	16	7	4	4	6	6	8	11	13	15	15	13	6	6	5
150°	3	3	0	2	0	6	7	7	12	14	10	4	6	0	15	5	14	14	16	16	15	13	12	8
180°	11	7	6	5	3	8	8	6	11	10	14	11	13	0	12	5	15	10	13	19	15	17	16	15
210°	24	20	22	15	10	12	12	10	12	8	18	18	17	0	5	7	11	7	7	19	11	18	20	20
240°	27	29	29	22	25	24	16	18	11	12	12	16	17	6	5	8	3	6	2	10	7	15	15	16
270°	16	21	20	21	32	28	19	19	11	12	5	10	15	19	10	12	2	3	3	2	4	9	9	9
300°	5	7	7	7	17	10	11	10	7	4	7	6	7	26	12	8	8	3	6	2	7	2	5	6
330°	3	3	0	1	2	1	4	4	3	0	6	4	3	19	9	3	11	3	3	3	3	2	1	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
15	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	1	1	0	0	2	2	2
25	6	7	4	1	0	0	0	1	0	0	0	1	0	0	0	6	1	5	4	1	4	3	5	8
35	10	16	13	3	0	1	2	2	0	0	4	5	3	0	0	3	7	5	5	2	8	7	12	14
45	13	21	16	10	5	3	6	1	1	2	10	10	7	4	5	3	14	7	5	5	9	9	16	16
55	14	18	14	12	11	3	5	0	3	4	7	9	6	13	10	8	12	9	6	7	10	8	14	10
65	14	10	12	10	7	4	1	3	5	6	4	9	3	13	7	9	5	9	4	9	10	6	11	10
75	12	9	9	10	8	12	2	8	8	10	8	11	4	4	6	11	4	10	2	13	8	11	8	10
85	10	7	7	10	18	19	6	10	12	13	10	12	10	4	12	14	6	11	6	15	10	15	7	10
95	9	4	8	10	15	21	13	13	18	20	10	16	22	21	20	11	8	11	16	18	13	14	9	8
110	6	3	10	12	15	18	27	21	24	21	14	15	27	28	17	9	16	13	20	19	15	14	9	5
140	2	3	6	12	15	11	26	24	19	12	17	8	15	13	11	11	18	10	15	8	9	9	5	3
≥																								
160	0	1	1	10	6	8	12	17	10	12	16	4	3	0	12	12	9	9	16	3	4	1	1	4

FREIBURG FEBRUARY 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	1	1	5	0	0	0	1	0	0	0	1	2	5	6	16	19	17	8	7	1	1	0	1	3
30°	2	1	6	1	0	0	5	5	2	0	1	2	4	0	8	11	8	8	10	6	3	0	2	3
60°	5	0	3	2	0	0	12	11	8	0	3	5	7	2	5	2	0	5	10	10	10	2	6	6
90°	6	1	0	2	0	3	10	8	12	0	3	7	4	6	2	2	0	5	10	12	12	6	4	6
120°	4	3	1	1	0	7	3	9	11	0	3	5	0	8	0	7	0	8	7	12	9	6	2	3
150°	6	5	1	0	0	3	1	17	12	3	4	7	0	6	2	7	0	13	5	15	10	6	4	2
180°	10	6	5	7	0	7	6	14	14	15	10	12	0	2	5	2	0	18	6	17	16	14	9	6
210°	14	14	15	23	13	10	12	9	14	24	14	9	4	4	6	2	8	10	8	10	18	23	14	12
240°	20	26	23	30	35	26	17	11	16	22	15	7	14	10	8	7	16	7	14	7	11	22	20	18
270°	19	26	24	23	34	25	17	11	9	20	20	16	24	15	11	11	17	10	15	7	4	13	21	20
300°	10	13	13	10	15	10	11	5	2	13	18	19	24	22	16	13	17	5	6	3	3	6	13	14
330°	3	4	4	1	3	0	5	0	0	3	8	9	14	19	21	17	17	3	2	0	3	2	4	7

Velocity jv' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	2	4	1	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0
25	7	6	9	4	0	6	3	6	0	0	0	0	0	0	0	0	0	2	4	6	4	3	1	1
35	15	9	11	10	0	12	3	6	0	0	1	0	0	2	0	0	0	4	5	8	8	7	4	9
45	19	10	13	15	3	8	7	4	2	2	4	2	0	6	2	3	0	5	3	6	11	7	8	20
55	16	14	10	12	9	3	9	4	3	7	5	4	0	2	5	5	8	7	6	6	11	5	8	20
65	11	14	4	8	14	3	7	2	6	7	8	4	0	8	8	5	25	4	2	5	7	4	9	10
75	10	12	7	11	16	6	5	0	17	7	13	10	7	6	11	5	26	5	1	5	5	6	12	6
85	10	11	10	12	14	9	5	6	23	16	17	13	25	4	14	8	8	14	4	9	9	11	11	7
95	6	11	9	9	16	11	11	19	17	25	20	10	36	11	16	17	8	12	10	12	15	14	12	5
110	3	6	9	7	17	15	18	24	17	20	18	17	25	24	18	24	17	5	23	11	16	15	15	6
140	1	4	9	6	9	15	17	17	12	9	11	25	7	23	16	17	8	12	25	11	9	14	13	9
≥																								
160	0	1	5	5	2	12	14	10	3	7	3	15	0	8	10	16	0	30	13	19	4	14	7	7

FREIBURG MARCH 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	1	0	2	0	1	1	0	4	4	2	2	4	8	10	4	5	11	15	7	5	4	2	6
30°	7	0	0	1	0	1	4	6	11	7	2	5	9	10	8	8	3	4	18	7	7	4	1	10
60°	5	1	0	0	0	3	10	17	11	6	8	10	16	5	6	15	10	0	12	14	5	5	2	10
90°	2	2	0	0	0	3	9	12	6	7	10	10	14	0	2	11	12	0	6	21	4	6	7	7
120°	3	2	2	0	0	3	6	3	6	9	10	5	9	3	4	4	8	0	8	14	5	6	10	4
150°	6	4	7	3	0	1	4	6	8	10	18	7	7	10	12	4	8	0	9	7	7	6	12	6
180°	11	8	15	10	3	3	1	12	8	15	22	10	5	13	12	4	8	7	6	6	12	10	17	10
210°	17	13	22	18	11	12	1	6	8	15	12	10	4	5	4	3	3	14	3	5	16	14	19	15
240°	17	22	27	25	29	27	13	9	8	10	4	16	5	3	2	7	3	18	5	5	13	15	15	18
270°	15	27	19	23	38	28	26	20	13	9	4	18	9	12	10	14	10	21	5	4	9	14	9	10
300°	9	16	7	13	18	14	19	9	13	6	4	7	11	19	16	16	16	14	5	4	9	10	4	2
330°	4	4	1	5	1	4	6	0	4	2	4	0	7	12	14	10	14	11	8	6	8	6	2	2

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
15	0	0	3	2	0	0	1	0	0	1	2	2	0	0	0	0	0	0	0	0	1	0	1	6
25	0	0	5	7	1	1	3	0	5	4	6	4	0	0	0	0	0	0	3	3	5	0	5	3
35	5	5	10	11	6	4	3	0	9	7	6	4	0	3	0	0	0	4	6	6	11	2	7	4
45	15	17	17	14	7	7	3	3	11	14	8	5	4	10	6	4	5	17	3	6	12	5	7	15
55	18	18	17	13	6	10	3	6	13	16	12	5	10	12	13	11	10	21	3	4	11	5	9	19
65	11	11	10	8	7	7	3	6	7	7	8	4	12	13	13	11	8	8	8	5	12	9	11	11
75	8	8	8	7	7	14	7	16	5	7	10	11	15	15	12	9	8	4	9	11	12	16	12	8
85	10	10	7	9	6	15	16	25	11	13	16	23	19	13	12	16	13	13	9	18	11	17	12	10
95	13	12	6	10	12	20	23	22	14	10	14	24	19	12	15	21	19	13	13	21	5	15	10	9
110	14	12	7	10	20	9	22	16	14	10	10	14	15	12	17	17	21	4	17	18	5	13	10	7
140	6	6	5	6	16	3	13	6	9	8	6	4	6	8	10	7	13	4	13	7	7	9	10	4
≥																								
160	0	1	4	3	12	0	3	0	2	3	2	0	0	2	2	4	3	12	16	1	8	9	6	1

FREIBURG APRIL 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	5	0	0	0	0	0	0	0	0	0	—	—	50	0	0	8	5	5	5	4	3	4	4
30°	9	7	0	1	0	0	5	0	13	0	0	—	—	25	25	0	11	8	16	7	7	0	3	6
60°	5	6	0	3	0	0	15	8	26	0	0	—	—	0	50	0	13	10	24	14	5	1	3	5
90°	0	3	0	1	0	0	15	25	13	6	12	—	—	0	25	12	8	10	23	16	5	5	3	5
120°	3	9	3	0	0	0	15	26	0	26	25	—	—	0	0	25	2	10	11	10	13	12	5	8
150°	12	21	14	6	19	0	25	8	6	32	13	—	—	0	0	25	6	10	5	8	16	19	11	10
180°	18	17	26	19	38	0	20	0	12	12	13	—	—	0	0	25	12	8	5	12	9	16	15	10
210°	12	4	24	25	19	0	5	0	6	0	25	—	—	0	0	13	8	3	2	9	5	7	14	12
240°	10	4	14	21	0	17	0	0	0	0	12	—	—	0	0	0	4	0	2	4	8	3	11	16
270°	11	10	9	17	6	42	0	8	6	6	0	—	—	0	0	0	6	8	5	5	12	8	14	15
300°	9	9	7	7	12	33	0	17	12	12	0	—	—	0	0	0	11	16	2	5	11	15	11	7
330°	5	5	3	0	6	8	0	8	6	6	0	—	—	25	0	0	11	12	0	5	5	11	6	2

Velocity v' /ms.⁻¹/ Hour U. T.

%	00	0'	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	—	—	0	0	0	0	0	0	0	3	0	0	0
15	1	1	0	0	0	0	0	0	0	0	0	—	—	0	0	0	0	0	0	0	7	0	0	0
25	7	2	0	3	0	0	0	0	0	0	0	—	—	0	0	0	2	0	3	4	3	8	3	2
35	14	7	1	7	6	0	0	17	0	0	0	—	—	0	0	0	6	0	5	8	7	11	9	8
45	21	18	8	11	20	17	0	33	0	13	0	—	—	0	0	0	8	8	8	8	3	12	10	13
55	23	19	12	14	20	33	0	17	6	26	0	—	—	0	0	0	6	15	13	6	2	10	7	11
65	11	12	13	10	12	17	10	0	12	13	12	—	—	0	12	0	4	8	14	6	5	7	6	8
75	5	9	15	7	12	8	25	0	6	0	26	—	—	0	25	0	6	0	16	6	9	5	8	9
85	6	7	15	10	12	17	25	0	6	6	12	—	—	0	13	0	11	0	14	8	16	8	16	11
95	5	8	14	14	12	8	20	0	19	12	13	—	—	25	13	25	19	17	8	13	20	12	22	12
110	5	7	9	13	6	0	15	8	26	12	25	—	—	50	25	50	21	35	8	17	23	10	15	12
140	2	3	4	6	0	0	5	17	19	12	12	—	—	25	12	25	11	17	8	14	11	4	4	7
≥																								
160	0	7	9	5	0	0	0	8	6	6	0	—	—	0	0	0	6	0	3	10	1	3	0	7

FREIBURG MAY 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	2	4	8	2	5	—	—	—	—	—	—	—	—	—	—	—	—	—	6	12	5	8	4
30°	5	2	7	4	3	10	—	—	—	—	—	—	—	—	—	—	—	—	—	8	17	7	7	5
60°	11	0	7	7	4	10	—	—	—	—	—	—	—	—	—	—	—	—	—	14	18	13	8	9
90°	10	0	6	5	7	5	—	—	—	—	—	—	—	—	—	—	—	—	—	14	13	11	7	13
120°	7	6	6	3	12	3	—	—	—	—	—	—	—	—	—	—	—	—	—	11	6	11	5	16
150°	7	18	8	7	14	2	—	—	—	—	—	—	—	—	—	—	—	—	—	17	4	11	9	12
180°	11	26	11	10	12	3	—	—	—	—	—	—	—	—	—	—	—	—	—	19	2	8	14	9
210°	14	26	13	10	8	10	—	—	—	—	—	—	—	—	—	—	—	—	—	8	0	4	12	11
240°	11	16	15	11	8	15	—	—	—	—	—	—	—	—	—	—	—	—	—	0	4	2	8	9
270°	7	4	13	9	12	17	—	—	—	—	—	—	—	—	—	—	—	—	—	0	10	4	7	3
300°	8	0	7	12	12	13	—	—	—	—	—	—	—	—	—	—	—	—	—	0	8	11	7	3
330°	7	0	3	14	6	7	—	—	—	—	—	—	—	—	—	—	—	—	—	3	6	13	8	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	2	0	0
15	2	0	1	2	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	5	0	0
25	5	0	6	7	1	6	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	5	1	2
35	8	4	11	11	3	5	—	—	—	—	—	—	—	—	—	—	—	—	—	6	2	8	7	7
45	10	13	12	12	8	9	—	—	—	—	—	—	—	—	—	—	—	—	—	17	7	15	11	12
55	8	34	11	10	10	17	—	—	—	—	—	—	—	—	—	—	—	—	—	18	9	14	8	11
65	3	17	9	10	9	9	—	—	—	—	—	—	—	—	—	—	—	—	—	11	11	7	5	4
75	8	4	11	12	10	6	—	—	—	—	—	—	—	—	—	—	—	—	—	8	16	5	6	3
85	14	2	11	12	13	12	—	—	—	—	—	—	—	—	—	—	—	—	—	14	16	8	9	8
95	12	4	8	11	17	14	—	—	—	—	—	—	—	—	—	—	—	—	—	11	14	9	13	17
110	5	8	8	7	15	9	—	—	—	—	—	—	—	—	—	—	—	—	—	6	11	7	12	21
140	7	4	6	5	8	5	—	—	—	—	—	—	—	—	—	—	—	—	—	6	7	5	9	10
≥																								
160	18	0	6	1	5	5	—	—	—	—	—	—	—	—	—	—	—	—	—	3	7	10	19	5

FREIBURG JUNE 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	4	6	4	11	4	17	—	5	6	0	0	0	0	5	7	4	6	3	2	2	5	3	4
30°	8	7	8	6	12	13	8	—	0	11	0	8	0	0	15	18	0	14	6	7	9	9	8	7
60°	7	9	10	7	9	13	8	—	0	6	19	17	0	25	20	24	0	18	9	7	14	9	11	13
90°	5	6	11	4	6	4	26	—	10	6	38	8	25	50	15	11	4	8	13	2	12	8	10	10
120°	6	5	8	7	11	4	25	—	20	6	25	8	50	25	10	0	7	0	9	5	9	7	11	7
150°	14	10	9	11	15	12	8	—	10	12	12	25	25	0	10	0	7	3	6	9	4	7	12	9
180°	18	17	12	10	8	12	0	—	0	12	6	26	0	0	5	0	7	6	3	13	4	7	9	13
210°	12	14	8	10	2	8	0	—	0	12	0	8	0	0	5	0	4	3	3	19	9	7	4	13
240°	7	9	5	13	2	13	0	—	0	6	0	0	0	0	10	4	0	6	6	11	12	11	8	7
270°	5	9	8	12	6	13	0	—	10	6	0	0	0	0	5	11	14	14	13	9	14	12	13	5
300°	5	7	9	10	9	4	0	—	25	11	0	0	0	0	0	14	32	14	20	11	9	11	9	6
330°	6	3	6	6	9	0	8	—	20	6	0	0	0	0	0	11	21	8	9	5	2	7	2	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	1	2	1	0	0	0	—	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0
15	2	4	6	4	2	0	0	—	0	0	6	0	25	0	0	0	0	0	0	0	0	7	7	6
25	8	7	5	9	9	4	0	—	0	0	13	0	50	0	0	0	4	0	0	2	4	13	10	13
35	12	9	5	13	16	13	0	—	0	10	6	0	25	0	0	4	7	6	3	9	9	13	13	10
45	17	15	12	16	16	16	17	—	0	20	6	17	0	0	10	11	11	13	6	13	7	13	15	7
55	20	20	18	15	14	13	33	—	0	10	13	33	0	0	25	11	14	9	3	9	4	12	15	7
65	12	14	11	9	8	8	17	—	6	0	13	17	0	0	20	7	7	6	6	2	4	7	11	6
75	7	8	7	6	6	13	0	—	25	5	13	0	0	0	5	7	4	6	16	7	4	3	7	7
85	4	4	7	9	9	13	8	—	32	15	6	8	0	25	5	7	7	6	16	17	7	3	5	10
95	5	5	9	10	9	8	17	—	19	15	0	17	0	50	10	18	14	9	19	14	14	3	5	16
110	9	6	11	7	8	8	8	—	12	5	6	8	0	25	5	24	21	17	22	9	17	4	5	14
140	4	4	6	3	3	4	0	—	6	5	12	0	0	0	5	11	11	13	9	9	15	7	3	4
≥																								
160	0	3	1	3	0	0	0	—	0	15	6	0	0	0	15	0	0	15	0	9	15	14	1	0

FREIBURG JULY 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	5	4	6	3	5	5	10	6	8	14	13	0	—	0	10	13	3	4	7	6	9	6	4	7
30°	8	5	10	7	7	6	10	0	13	14	13	25	—	5	10	17	13	18	11	6	0	9	7	9
60°	6	5	8	11	7	7	25	0	13	14	8	50	—	15	5	16	21	28	21	12	7	15	11	16
90°	5	5	3	6	7	10	35	13	8	11	8	25	—	15	10	7	16	20	24	15	17	15	9	16
120°	8	6	1	2	9	11	15	26	13	11	8	0	—	5	20	0	8	11	11	10	16	9	7	8
150°	15	7	6	1	8	11	0	13	13	11	13	0	—	0	10	0	6	4	0	3	5	6	12	8
180°	17	11	11	4	5	7	0	0	4	7	16	0	—	0	0	2	8	0	0	4	0	6	19	11
210°	10	17	18	11	5	5	0	0	0	7	13	0	—	5	0	5	11	0	0	10	5	3	12	7
240°	6	17	21	17	8	10	0	6	4	4	4	0	—	10	0	5	8	0	0	9	9	2	5	4
270°	8	12	12	17	15	15	0	12	8	0	0	0	—	15	5	9	6	4	4	6	5	8	4	5
300°	8	7	3	14	15	7	0	12	8	0	0	0	—	20	15	13	0	7	11	9	9	12	5	4
330°	4	4	1	7	9	6	5	12	8	7	4	0	—	10	15	13	0	4	11	10	18	9	5	5

Velocity v' /ms⁻¹/Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	1	0	0	1	0	0	0	0	0	0	0	—	0	0	0	0	0	0	0	0	0	2	2
15	5	2	0	0	2	1	0	0	4	0	0	0	—	0	0	0	0	4	0	0	2	0	12	7
25	9	2	1	2	3	2	0	0	13	0	4	0	—	0	0	0	3	14	4	1	4	2	21	10
35	8	4	4	5	4	4	0	0	13	0	8	0	—	0	6	2	11	21	7	4	5	8	9	8
45	12	11	11	9	8	8	10	0	13	7	21	0	—	0	19	11	22	14	7	7	14	20	5	12
55	17	16	16	12	10	11	20	0	17	14	34	0	—	0	19	16	22	4	7	10	21	22	15	17
65	10	15	10	10	8	8	10	0	8	7	17	0	—	0	6	7	8	0	4	9	16	11	7	12
75	7	13	14	9	9	6	0	17	4	4	0	0	—	0	0	2	3	0	4	4	12	5	2	4
85	10	13	20	11	12	5	5	33	8	7	0	0	—	0	0	5	6	0	11	6	5	8	4	4
95	9	10	12	15	13	11	20	25	8	18	4	25	—	20	12	16	8	11	21	10	2	9	4	5
110	7	9	8	15	16	19	25	17	8	29	8	50	—	45	26	28	11	21	24	13	5	8	5	4
140	4	4	4	9	10	17	10	8	4	14	4	25	—	30	12	13	6	11	11	9	7	5	7	2
≥																								
160	1	0	0	3	4	8	0	0	0	0	0	0	—	5	0	0	0	0	0	27	7	2	7	13

FREIBURG AUGUST 1958

Region F

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	4	3	13	8	5	8	8	13	5	—	—	—	16	17	6	10	8	0	6	14	4	4	4
30°	6	8	6	4	9	3	8	14	17	7	—	—	—	0	8	12	20	8	0	12	4	4	4	10
60°	7	10	7	2	8	5	13	23	13	9	—	—	—	0	8	6	25	18	0	6	8	11	7	13
90°	10	5	3	1	4	12	13	23	8	11	—	—	—	0	4	0	10	8	25	0	18	12	9	19
120°	9	3	4	2	2	13	13	8	13	7	—	—	—	0	0	13	0	0	50	6	13	9	7	2
150°	10	8	5	7	3	7	20	0	14	5	—	—	—	0	0	26	5	8	25	12	2	7	14	7
180°	19	13	7	12	5	3	17	0	8	7	—	—	—	0	0	13	10	17	0	6	0	7	19	19
210°	16	14	17	13	9	6	4	8	2	7	—	—	—	0	0	0	5	8	0	0	2	7	14	20
240°	7	14	21	12	14	12	0	4	0	9	—	—	—	0	0	0	0	0	0	0	4	5	9	8
270°	4	13	17	8	15	17	0	0	2	13	—	—	—	17	8	6	0	0	0	12	6	7	5	3
300°	6	5	7	10	12	11	0	4	4	13	—	—	—	34	25	12	5	8	0	26	13	15	4	3
330°	3	3	3	16	11	6	4	8	6	7	—	—	—	33	30	6	10	17	0	14	16	12	4	2

Velocity v' / ms⁻¹ / Hour U. T.

[illegible]

FREIBURG SEPTEMBER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	8	10	12	5	9	7	9	38	5	8	40	0	0	14	4	8	18	11	10	3	1	2	4	2
30°	4	6	10	7	7	9	9	37	9	10	25	6	0	12	13	15	18	16	12	5	5	6	1	3
60°	5	4	10	9	10	10	9	13	14	13	5	12	17	5	25	20	18	18	13	8	8	6	1	6
90°	3	3	8	9	9	10	8	0	11	13	0	19	33	5	12	16	18	9	14	11	10	6	3	4
120°	2	5	4	9	6	10	7	0	9	8	0	26	17	11	0	8	12	6	10	14	15	9	7	1
150°	3	7	4	9	6	9	9	0	7	2	0	19	0	9	1	3	3	6	4	16	24	12	12	3
180°	6	8	6	7	5	7	11	0	2	0	0	12	0	5	3	2	0	6	4	13	15	14	16	9
210°	8	6	3	3	7	4	8	0	5	0	0	6	0	3	6	1	0	5	2	5	4	14	18	13
240°	12	5	3	3	9	2	6	0	11	4	0	0	0	3	10	2	0	3	0	2	2	12	12	17
270°	17	10	8	9	8	9	8	0	11	13	0	0	8	6	10	7	0	2	6	6	7	10	7	18
300°	17	18	15	18	12	13	8	0	9	17	5	0	17	12	9	10	3	6	13	11	7	7	10	15
330°	15	18	17	12	12	10	8	12	7	12	25	0	8	15	7	8	10	12	12	6	2	2	9	9

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0
15	4	1	0	2	1	1	3	13	2	2	0	0	0	2	1	7	0	0	2	6	2	2	1	1
25	8	4	5	6	7	3	9	25	7	11	6	0	0	5	6	9	4	2	8	8	7	7	2	6
35	8	12	14	6	12	5	10	13	9	17	12	0	0	5	7	12	11	7	14	5	7	9	5	10
45	14	25	21	13	21	12	12	13	16	18	20	19	8	5	15	15	16	20	16	11	14	12	15	17
55	18	26	22	20	28	19	14	24	21	19	26	38	17	9	23	15	18	25	10	18	26	17	19	20
65	11	12	12	13	15	10	10	12	9	11	12	19	25	12	12	9	16	12	4	9	17	11	13	13
75	9	4	5	7	4	7	9	0	2	4	6	6	33	19	3	4	14	5	4	6	4	8	15	9
85	10	3	4	7	4	9	6	0	5	2	12	12	17	16	6	3	10	7	8	9	4	10	11	7
95	8	3	5	10	4	9	7	0	7	0	6	6	0	11	6	8	6	9	12	9	7	10	7	5
110	7	4	7	11	3	10	12	0	11	2	0	0	0	11	9	13	4	9	10	9	8	10	7	7
140	3	3	4	5	1	7	7	0	9	6	0	0	0	5	9	4	1	4	8	6	4	4	4	4
≥																								
160	0	3	1	0	0	8	1	0	2	8	0	0	0	0	3	0	0	0	4	2	0	0	1	0

FREIBURG OCTOBER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	6	9	9	4	3	4	9	4	0	0	0	5	2	7	4	5	4	2	4	2	4	0	3
30°	5	4	6	7	7	2	5	5	10	6	0	13	5	3	3	4	9	4	5	6	4	9	3	4
60°	5	6	3	5	5	5	2	2	8	19	25	26	2	2	3	6	14	4	9	13	4	13	8	12
90°	8	5	3	2	4	5	1	5	10	19	50	13	0	2	10	8	11	4	7	10	8	11	11	14
120°	12	4	2	4	4	2	2	14	14	6	25	0	2	12	13	10	9	8	7	7	12	7	14	5
150°	15	10	5	8	5	0	4	14	8	0	0	4	11	22	9	11	11	19	11	12	12	9	15	7
180°	12	14	13	10	5	3	5	7	4	0	0	8	21	12	9	10	11	19	11	12	14	10	11	16
210°	8	13	18	10	7	10	10	2	8	0	0	8	18	6	9	8	5	6	7	7	12	8	5	12
240°	5	10	14	10	13	15	18	2	8	0	0	8	11	11	6	8	0	0	5	4	7	8	4	4
270°	5	8	10	13	21	20	20	9	11	12	0	8	9	12	8	11	5	6	9	10	10	10	11	5
300°	10	10	8	12	17	22	19	17	11	26	0	8	9	11	12	12	11	15	16	6	10	8	13	10
330°	9	10	9	10	8	13	10	14	4	12	0	4	7	5	11	8	9	11	11	9	4	4	5	8

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
15	2	1	2	1	0	0	0	0	0	0	0	0	0	3	1	2	0	0	2	1	0	4	3	0
25	6	6	6	3	1	4	0	0	4	0	0	0	0	6	3	4	5	2	5	4	2	7	8	0
35	12	10	9	6	7	11	1	0	11	6	8	0	3	5	7	2	14	4	5	4	8	9	13	3
45	23	15	14	11	20	25	10	9	14	19	0	4	8	8	15	18	19	10	20	14	14	12	18	18
55	27	18	16	15	23	31	18	21	11	19	0	13	8	14	19	34	13	19	37	26	13	13	18	27
65	16	11	9	13	11	14	12	18	5	19	0	13	5	12	14	24	9	15	20	16	8	8	9	17
75	6	9	9	12	5	0	8	16	9	25	25	4	5	6	10	6	13	6	2	4	11	4	7	11
85	3	10	11	10	5	4	8	14	12	12	50	0	3	5	7	2	13	8	0	6	8	4	9	8
95	2	8	12	10	7	7	11	11	11	0	25	8	12	12	6	0	7	13	2	7	6	7	6	6
110	2	7	9	10	10	4	16	9	12	0	0	25	27	18	9	0	5	13	5	10	11	14	6	7
140	1	4	3	6	6	0	12	2	9	0	0	25	16	9	7	0	2	8	2	7	11	12	3	3
≥																								
160	0	1	0	3	5	0	0	5	2	0	0	8	13	2	2	8	0	2	0	1	8	5	0	0

FREIBURG NOVEMBER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	8	5	11	6	6	4	0	3	0	3	0	0	7	0	7	0	5	10	4	5	4	5	4
30°	4	5	5	8	6	6	6	5	9	0	3	0	0	4	0	13	0	7	11	8	5	8	8	4
60°	4	3	5	4	9	5	4	6	15	5	5	0	0	4	6	13	0	9	9	13	8	10	8	4
90°	4	2	3	2	7	4	1	8	14	11	8	5	6	4	6	8	7	9	8	11	10	8	4	3
120°	2	1	1	1	3	4	2	10	10	17	8	7	6	4	6	7	11	7	8	9	9	6	3	4
150°	6	4	4	1	4	4	7	12	9	16	11	9	3	7	9	7	14	7	8	13	9	8	12	7
180°	19	8	8	3	9	8	9	10	11	11	19	13	3	12	16	7	14	16	11	15	14	13	20	19
210°	22	15	14	11	11	14	6	5	10	12	16	21	12	11	20	10	14	17	11	11	11	15	15	25
240°	13	20	18	20	10	19	11	7	7	12	9	20	19	7	16	13	11	7	6	4	7	11	7	17
270°	8	14	15	17	12	13	22	14	5	6	9	13	20	11	12	10	7	2	3	5	7	6	6	5
300°	8	10	13	11	13	9	20	14	4	5	6	7	19	15	9	5	11	7	6	7	8	6	7	4
330°	6	10	9	11	10	8	8	9	3	5	3	5	12	14	0	0	11	7	9	0	7	5	5	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	1	0	2	0	1	0	1	1	2	0	0	0	0	0	0	0	0	1	3	1	1	0	0
25	5	3	1	5	1	3	0	2	1	3	0	0	0	2	3	3	0	2	4	5	4	3	1	0
35	6	5	4	5	2	4	0	2	1	2	0	0	0	4	6	8	0	5	6	7	7	4	4	1
45	17	19	15	9	12	11	5	8	1	6	5	7	3	2	6	19	7	7	12	10	17	7	12	6
55	27	27	21	14	21	18	11	12	3	14	12	13	9	5	6	30	14	11	17	9	18	11	15	8
65	15	14	11	10	14	12	8	6	4	9	15	9	12	16	3	23	7	11	11	3	8	6	8	5
75	4	3	9	10	6	4	8	5	8	6	18	7	9	18	3	8	7	9	3	4	3	6	6	6
85	4	3	11	7	6	5	13	10	11	12	14	9	6	11	9	2	21	11	5	11	3	12	9	12
95	7	5	10	6	9	9	18	19	20	19	12	18	16	14	19	2	26	14	12	17	7	17	13	19
110	9	9	10	12	14	12	20	24	28	19	12	26	26	19	26	3	14	9	16	18	14	20	16	22
140	4	6	5	12	9	7	11	11	16	8	7	11	16	9	16	2	4	5	10	9	11	12	10	14
≥																								
160	0	5	3	8	6	14	6	0	6	0	5	0	3	0	3	0	0	16	2	4	7	1	6	7

FREIBURG DECEMBER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	0	5	6	3	4	6	6	0	5	0	0	0	3	9	4	8	8	2	1	4	3	0	0
30°	6	4	4	4	7	6	2	7	5	2	7	0	8	4	5	6	10	10	4	4	3	1	2	0
60°	8	2	6	3	9	9	1	7	9	2	7	15	13	4	11	8	13	14	6	5	4	3	3	2
90°	6	2	4	2	8	8	4	5	13	7	4	20	13	4	17	11	14	16	10	9	6	6	2	3
120°	3	2	3	2	7	5	12	10	16	16	0	10	4	7	9	13	13	14	16	15	10	11	3	5
150°	3	3	5	6	6	5	13	14	16	23	0	0	0	7	5	11	10	9	20	22	21	16	12	12
180°	12	13	11	12	8	7	7	14	14	20	14	5	8	10	5	8	7	8	17	18	23	21	25	21
210°	19	25	13	16	14	9	9	13	9	9	32	10	15	14	7	8	4	6	10	9	12	16	27	22
240°	19	24	14	15	14	13	16	9	6	2	25	10	13	10	11	6	2	4	7	4	5	10	15	18
270°	15	15	20	14	10	17	17	7	4	2	11	15	13	11	7	6	5	5	4	5	4	4	7	12
300°	7	10	15	12	9	11	13	8	4	5	0	15	13	16	5	11	7	6	2	5	4	4	4	5
330°	0	0	0	8	5	6	0	0	4	7	0	0	0	10	9	8	7	0	2	3	4	5	0	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
15	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1
25	6	3	0	0	1	3	0	2	0	0	4	0	0	0	0	2	1	1	1	3	1	4	4	4
35	10	6	2	0	4	3	0	5	1	0	7	0	0	0	0	8	4	4	3	8	1	5	5	8
45	10	9	6	3	7	5	3	7	5	2	4	0	0	1	2	17	9	11	7	10	4	6	10	12
55	11	9	6	7	7	7	6	7	6	4	0	0	0	3	4	16	11	16	9	9	7	7	17	14
65	11	6	10	10	7	8	7	8	6	4	7	0	5	3	5	6	8	13	9	7	7	6	14	11
75	11	6	17	12	11	15	12	12	9	7	14	0	10	4	16	6	8	15	12	15	11	11	14	9
85	8	10	12	14	14	19	15	12	9	12	11	5	10	9	24	13	10	11	13	18	18	14	14	11
95	8	16	12	18	16	19	19	13	16	16	25	25	21	14	13	17	9	15	11	19	13	9	9	9
110	11	21	20	19	18	12	25	18	26	16	17	40	25	30	12	13	21	10	17	7	17	15	10	10
140	9	11	13	12	12	5	12	12	15	16	11	25	15	22	16	6	10	6	10	7	9	11	5	7
≥ 160	4	2	2	5	3	3	1	4	7	23	11	5	0	7	7	0	1	4	4	5	6	5	0	5

FREIBURG JANUARY 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	3	8	7	6	0	7	9	1	2	7	0	0	0	30	12	8	8	0	17	13	7	5	7
30°	5	0	8	7	6	4	5	5	4	7	4	0	0	0	13	13	10	4	4	17	8	4	6	6
60°	8	0	13	11	8	8	7	0	8	7	3	0	8	0	0	9	8	8	11	11	4	3	5	11
90°	8	5	17	13	8	8	7	2	11	4	3	0	18	0	3	5	12	21	14	4	4	1	6	13
120°	5	15	17	13	3	15	11	9	13	5	5	5	8	6	6	7	17	22	17	0	4	3	9	14
150°	12	17	13	11	3	16	15	20	9	10	12	10	0	12	3	9	13	13	17	4	10	7	14	16
180°	20	10	4	4	8	11	13	23	9	17	16	5	0	20	3	11	5	8	7	11	17	10	18	15
210°	13	10	4	4	19	13	9	9	17	21	17	20	8	26	9	9	4	8	0	14	13	15	13	11
240°	10	17	8	11	25	13	7	0	17	14	16	40	25	12	3	7	4	4	4	11	4	20	8	6
270°	12	13	4	11	11	6	5	5	7	7	9	20	25	6	0	3	4	0	11	4	2	17	7	2
300°	5	5	0	4	0	4	5	9	1	4	3	0	8	12	6	4	7	0	11	0	8	7	5	0
330°	0	5	4	4	3	2	9	9	3	2	5	0	0	6	24	11	8	4	4	7	13	6	4	2

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	4
25	3	15	0	4	0	0	2	0	0	0	0	0	0	0	3	0	2	4	0	0	4	1	1	13
35	3	8	0	14	0	0	6	0	1	0	2	0	0	0	6	3	4	8	4	0	4	4	4	13
45	8	8	10	24	3	6	15	13	5	1	7	0	0	5	13	7	12	4	14	7	4	12	9	6
55	18	14	20	21	5	13	22	28	8	2	7	0	0	10	19	5	17	0	17	14	8	19	11	4
65	13	15	10	7	3	8	15	16	10	3	7	0	8	5	16	5	10	0	7	7	16	12	7	4
75	17	14	5	0	0	6	8	6	10	4	9	0	17	5	13	11	5	8	0	0	15	10	6	4
85	18	10	20	4	5	8	6	8	9	10	12	10	8	15	9	17	10	21	0	11	8	14	14	8
95	8	5	25	11	14	15	6	16	14	26	21	35	17	15	6	20	13	26	7	25	11	17	22	17
110	7	3	10	11	19	20	8	11	17	31	22	40	33	5	6	16	13	21	18	21	13	10	16	17
140	2	0	0	4	15	8	4	2	12	17	11	15	17	0	6	8	8	8	18	11	11	1	7	8
≥																								
160	7	0	0	0	36	16	8	0	14	6	2	0	0	40	3	8	5	0	15	4	4	0	3	2

FREIBURG FEBRUARY 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	1	5	4	6	6	12	9	0	3	1	2	0	2	3	6	7	9	7	6	0	0	6	4	4
30°	4	3	5	6	6	10	9	4	4	0	0	0	0	2	5	5	9	6	7	3	6	0	0	6
60°	10	1	8	3	6	3	7	13	7	1	1	0	0	1	3	3	8	10	9	6	11	0	0	6
90°	8	1	9	6	9	3	5	21	11	10	7	0	1	3	2	5	11	10	9	8	6	6	7	10
120°	4	5	7	11	11	9	7	21	20	27	17	13	7	6	5	10	14	8	10	14	6	12	14	12
150°	8	10	8	11	8	14	11	13	22	28	24	30	20	13	8	10	10	9	9	14	18	13	11	12
180°	13	14	10	8	6	12	13	8	15	19	27	27	25	17	9	8	6	11	4	11	20	13	7	12
210°	13	15	12	7	6	8	9	8	6	7	14	13	17	15	10	4	4	9	4	8	14	13	7	8
240°	18	14	15	10	12	5	5	8	3	2	2	7	11	14	12	5	4	8	10	3	11	12	11	2
270°	14	14	12	15	15	8	7	4	2	1	0	5	7	13	15	13	7	6	16	8	5	6	14	2
300°	5	11	6	11	9	8	9	0	3	2	2	4	5	9	15	18	9	6	10	17	3	6	14	8
330°	2	7	4	6	6	8	9	0	4	2	4	1	5	4	10	12	9	10	6	8	0	13	11	12

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	3	0	0
15	1	0	0	3	2	5	0	0	0	0	0	1	1	1	1	1	0	0	8	0	0	6	0	0
25	3	2	0	8	3	10	0	0	1	0	1	5	5	2	4	3	2	2	11	0	0	3	0	2
35	4	5	1	13	2	5	0	0	3	0	1	9	10	3	9	6	5	6	5	0	3	3	4	10
45	12	8	8	12	8	5	5	17	9	6	6	13	17	12	17	11	10	13	3	11	6	13	11	18
55	17	14	15	12	15	10	9	32	13	11	11	14	21	19	18	15	11	20	6	21	3	16	14	17
65	14	13	11	10	9	8	9	17	13	7	14	10	13	12	7	8	8	11	11	17	0	6	14	8
75	11	10	8	10	5	8	9	0	13	7	19	8	8	9	11	8	8	1	17	14	8	3	14	4
85	12	12	7	10	8	17	13	0	12	13	23	10	10	11	11	12	10	2	11	17	17	13	14	6
95	11	17	12	7	12	22	21	4	12	19	14	13	8	11	8	11	10	7	5	14	11	16	11	12
110	5	14	22	7	16	10	16	13	12	21	9	12	5	11	7	11	12	13	9	6	17	9	7	13
140	3	5	14	5	12	0	9	13	7	12	2	5	2	7	4	9	10	16	9	0	24	6	7	8
≥																								
160	7	0	2	2	8	0	9	4	5	4	0	0	0	2	3	5	14	9	3	0	11	3	4	2

FREIBURG MARCH 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	8	8	5	5	3	7	7	8	4	6	3	7	8	13	13	6	10	3	11	0	5	0	25
30°	4	11	12	2	9	12	5	11	11	7	6	3	7	7	9	10	3	13	8	9	0	2	0	15
60°	4	13	11	2	11	10	7	11	9	8	6	2	4	4	3	8	5	13	18	2	0	0	6	5
90°	4	11	7	3	9	8	8	13	14	11	8	5	4	4	4	6	12	10	18	5	2	5	10	0
120°	4	6	5	7	8	11	7	13	20	15	11	10	6	5	9	7	19	8	12	13	11	11	6	0
150°	8	5	5	13	6	8	10	10	13	16	13	11	7	6	9	9	15	10	9	19	24	16	6	0
180°	17	8	5	16	6	4	6	7	7	13	15	14	10	10	5	8	6	11	4	16	28	18	22	0
210°	22	9	12	15	5	4	6	4	4	10	13	17	13	13	4	4	2	8	5	9	21	13	30	10
240°	17	9	19	13	6	8	19	4	4	5	8	12	13	13	7	4	2	2	5	2	11	7	17	20
270°	8	8	12	12	12	11	19	8	4	4	4	10	12	12	12	7	9	1	5	2	3	7	3	10
300°	4	6	2	7	15	10	6	8	3	4	4	8	10	10	12	11	11	5	8	5	0	9	0	5
330°	4	6	2	5	8	6	0	4	3	3	6	5	7	8	13	13	10	9	7	7	0	7	0	10

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
15	0	0	1	0	0	0	0	0	2	0	0	1	1	1	1	0	3	1	0	4	0	2	0	5
25	2	0	2	2	2	0	3	1	6	3	1	3	5	5	3	1	6	3	2	13	3	11	0	10
35	4	0	2	8	6	0	8	4	8	9	4	10	10	11	6	3	5	7	7	17	5	15	3	5
45	4	5	7	17	9	4	11	8	14	15	13	22	16	15	11	8	7	11	12	23	14	11	11	5
55	4	9	11	17	8	7	8	11	23	16	19	26	20	15	11	14	9	14	14	24	20	8	13	10
65	6	5	5	10	6	5	3	8	18	10	11	12	14	9	6	15	5	9	13	11	11	6	18	5
75	13	8	2	5	6	5	3	12	9	7	5	3	6	7	10	6	7	7	13	0	8	6	24	0
85	13	18	5	3	5	9	8	16	4	6	5	4	5	6	8	5	9	10	11	0	10	6	17	5
95	15	19	12	8	11	16	15	11	4	5	9	6	6	7	10	10	10	10	10	2	13	4	3	15
110	20	16	23	12	19	20	13	8	6	11	15	6	8	10	15	17	13	10	12	4	12	4	0	15
140	13	8	18	8	12	14	12	9	3	11	11	4	5	8	11	10	13	9	6	2	4	6	3	5
≥																								
160	6	12	12	10	16	20	16	12	2	7	7	4	3	7	9	7	14	9	0	0	0	21	8	20

FREIBURG APRIL 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	13	8	4	13	8	9	13	12	14	12	8	13	9	8	11	10	8	8	10	10	6	6	3
30°	5	2	12	8	14	8	9	12	10	14	12	12	12	12	10	12	7	8	10	5	7	8	12	7
60°	5	0	10	14	5	9	12	10	10	11	10	15	7	8	10	9	7	10	10	2	3	6	7	3
90°	3	2	3	8	1	10	11	10	10	9	8	13	5	4	8	5	8	10	10	5	4	2	0	3
120°	0	7	0	1	5	10	9	11	7	7	11	12	9	9	8	4	9	12	10	8	9	8	6	13
150°	2	7	3	3	9	8	8	7	4	4	10	8	12	11	9	7	9	10	10	10	16	20	12	16
180°	9	5	8	10	11	5	6	4	4	5	7	6	12	11	9	9	7	6	8	7	17	18	13	9
210°	17	11	10	15	11	7	4	2	4	8	4	6	12	10	6	10	7	6	4	7	13	11	12	15
240°	18	16	13	15	9	11	8	2	11	5	4	5	7	7	5	8	8	4	4	16	10	8	13	22
270°	15	7	16	10	8	9	9	6	8	5	5	5	2	5	8	7	7	5	6	18	6	8	12	9
300°	13	9	10	6	7	7	7	11	10	8	7	5	2	7	10	8	8	10	10	7	1	4	7	0
330°	6	21	7	6	7	8	8	12	10	10	10	5	7	7	9	10	12	11	10	5	4	1	0	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0
15	0	5	2	0	1	0	2	1	2	2	2	3	2	2	2	1	3	2	2	0	4	0	0	0
25	0	9	3	3	3	1	3	2	3	3	6	8	8	6	6	4	8	4	5	2	12	3	8	0
35	0	5	2	6	1	2	5	4	6	6	9	13	13	10	9	6	11	8	7	7	18	15	17	0
45	3	0	5	8	6	7	9	10	13	14	13	18	17	17	15	10	12	16	12	16	20	27	8	10
55	5	0	9	9	11	12	11	16	20	20	17	20	19	22	17	14	22	17	15	18	14	19	0	20
65	8	2	6	5	8	8	7	15	16	12	11	11	13	15	12	13	14	9	12	7	4	8	0	10
75	15	7	11	6	8	9	9	12	8	5	7	6	8	10	8	10	4	6	11	4	3	5	0	0
85	15	7	18	13	11	14	12	8	6	8	7	6	5	8	8	7	3	9	11	9	7	3	0	0
95	5	13	17	11	13	11	11	9	8	12	8	6	6	5	8	6	5	8	9	12	7	5	17	10
110	8	27	14	11	15	8	11	14	10	11	10	6	7	2	7	12	6	9	9	14	4	10	33	20
140	19	20	6	11	12	11	11	8	6	5	6	2	2	1	3	11	5	7	5	9	3	5	17	15
≥																								
160	22	5	7	17	11	17	9	1	1	1	4	0	0	1	5	6	3	4	2	2	4	0	0	15

FREIBURG MAY 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	8	10	16	12	8	16	7	7	7	11	4	4	6	8	9	12	8	12	10	7	11	12	6
30°	12	6	13	11	6	8	9	14	11	11	16	11	9	14	16	15	16	16	13	8	10	11	14	6
60°	12	8	7	4	4	12	11	9	17	16	15	17	19	19	20	21	16	16	11	7	11	7	9	4
90°	5	15	6	2	4	12	11	11	21	19	12	16	17	16	15	13	15	10	9	7	7	7	5	6
120°	4	16	10	1	7	6	6	20	10	15	13	11	9	9	10	9	12	13	11	10	7	16	11	9
150°	10	13	11	7	15	3	4	20	2	6	10	8	6	4	11	4	8	9	13	10	11	20	14	7
180°	16	10	10	14	17	4	4	9	4	2	6	8	4	4	7	2	3	5	12	11	12	11	11	13
210°	15	6	10	14	8	6	5	2	7	4	4	8	6	3	2	4	2	4	5	9	7	2	4	21
240°	7	6	7	11	4	13	6	0	8	4	3	5	7	3	2	5	1	6	0	5	2	0	2	15
270°	4	6	5	6	3	13	5	2	6	4	2	4	4	6	4	4	3	5	2	4	5	2	4	6
300°	4	2	5	4	6	9	7	4	3	6	2	4	7	9	4	5	6	2	4	7	11	5	5	3
330°	4	4	6	10	14	6	16	2	4	6	6	4	8	7	4	7	8	1	7	10	10	8	9	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	1	0	0	0	0	2	0	1	0	0	0	1	0	0	1	0	1	1	2	0	0	0
15	5	2	2	0	1	1	3	6	1	2	2	2	2	3	2	4	4	3	7	2	10	2	0	2
25	14	4	8	4	2	6	9	10	8	10	6	10	9	7	10	12	8	7	12	6	17	9	5	3
35	16	4	16	11	2	12	13	10	17	18	10	16	16	12	18	16	8	9	11	10	12	14	11	2
45	21	18	20	22	11	16	19	17	21	19	21	25	20	19	21	19	16	19	15	17	13	14	16	12
55	23	28	17	26	20	19	20	26	25	15	22	22	21	25	21	22	23	26	20	24	18	11	22	26
65	10	12	10	14	11	11	10	13	17	9	12	10	12	12	12	11	13	14	11	14	10	5	12	15
75	3	0	7	8	4	6	5	0	7	4	9	5	7	4	6	4	7	7	3	6	3	5	7	5
85	5	2	7	8	8	9	5	0	2	7	9	5	7	5	4	4	8	8	3	7	3	9	9	8
95	3	6	5	3	12	7	6	2	1	7	5	2	3	5	3	3	4	6	3	6	5	11	7	9
110	0	6	4	0	15	5	7	4	1	4	3	1	2	4	2	2	4	1	5	5	5	13	7	8
140	0	2	3	1	10	4	3	4	0	1	1	1	1	2	1	2	3	0	4	2	2	7	4	5
≥																								
160	0	16	0	3	4	4	0	6	0	3	0	1	0	1	0	1	1	0	5	0	0	0	0	5

FREIBURG JUNE 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	8	10	11	8	10	13	7	7	4	4	6	7	10	11	10	9	12	8	6	7	5	3	9
30°	4	5	7	11	5	11	14	9	10	11	8	14	10	14	15	17	17	16	15	9	5	10	7	9
60°	4	6	6	9	4	9	10	13	14	20	13	19	15	14	15	14	19	17	18	13	8	10	8	6
90°	6	11	10	5	7	11	10	18	19	20	16	13	15	10	12	10	16	14	13	14	11	8	6	7
120°	9	12	9	5	11	13	12	16	16	18	17	7	13	9	8	10	10	14	12	10	9	9	8	6
150°	11	12	10	7	12	7	9	8	9	13	14	6	7	8	6	8	6	11	10	9	10	11	11	6
180°	13	10	10	7	9	4	5	3	4	6	9	7	4	6	6	7	4	5	5	8	15	12	16	12
210°	13	6	10	10	6	4	5	3	3	1	5	8	4	4	5	7	4	1	2	7	13	12	18	17
240°	11	5	10	10	6	6	6	5	4	0	3	6	6	4	5	4	3	0	1	7	7	8	12	11
270°	9	5	7	10	8	7	5	5	4	1	4	5	7	4	5	3	4	1	3	6	3	6	5	6
300°	9	9	4	7	12	9	4	6	4	3	4	5	6	8	5	4	4	4	7	5	5	5	3	5
330°	7	11	7	8	12	9	7	7	6	3	3	4	6	9	7	6	4	6	6	6	7	4	3	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	1	1	1	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	2	1	0
15	3	5	3	5	2	3	3	4	4	2	3	4	2	3	4	4	4	3	4	2	6	6	3	2
25	9	9	4	9	7	9	6	13	11	9	6	12	12	10	11	10	11	9	12	6	12	7	6	5
35	9	8	5	9	12	11	7	15	12	13	9	17	19	14	14	14	14	17	15	10	13	5	7	5
45	14	15	14	13	21	13	16	19	17	20	19	18	22	19	15	19	19	25	19	18	18	12	13	8
55	20	22	21	19	22	17	23	21	25	24	28	17	18	20	15	21	24	21	20	23	21	19	20	12
65	11	11	11	12	11	10	14	11	14	14	14	10	10	12	10	12	14	9	12	12	11	10	12	10
75	3	4	6	4	3	7	7	3	3	4	5	5	5	8	6	5	3	4	5	6	3	3	9	11
85	7	7	12	6	6	10	7	4	4	4	5	6	5	5	8	4	3	4	5	6	3	6	10	14
95	9	6	11	8	6	9	5	4	4	4	5	4	3	2	8	2	4	4	4	5	5	9	8	13
110	8	5	7	8	6	5	4	3	4	3	3	3	2	2	5	3	3	3	3	6	5	10	6	10
140	4	4	4	4	3	2	4	2	2	2	2	3	1	3	2	2	1	1	1	4	2	7	4	6
≥ 160	3	3	1	2	1	3	4	1	0	1	1	1	1	1	1	3	0	0	0	2	0	4	1	4

FREIBURG JULY 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	8	16	16	12	9	8	10	3	6	6	3	5	11	10	14	14	6	13	9	6	9	9	6
30°	6	6	14	15	12	13	10	10	5	6	9	8	10	15	12	16	17	10	16	13	8	8	6	7
60°	4	4	11	11	8	17	16	14	15	11	12	16	14	16	12	15	17	18	16	13	11	7	8	7
90°	6	7	5	9	6	17	21	21	22	16	13	18	14	13	9	11	11	18	13	12	12	8	9	4
120°	10	10	0	7	7	10	17	18	21	16	11	14	9	9	9	7	3	13	7	11	12	9	9	4
150°	17	11	4	5	6	2	8	7	12	13	9	8	8	8	10	5	5	9	4	10	11	10	10	7
180°	17	11	8	3	4	1	2	1	4	10	9	6	8	8	10	3	8	4	3	9	10	10	10	12
210°	14	11	8	4	6	4	3	2	4	6	7	6	8	6	6	4	6	2	4	7	9	14	12	21
240°	11	10	7	8	9	7	2	4	4	3	5	3	7	4	5	6	3	2	5	5	7	10	10	18
270°	4	8	8	8	10	6	3	3	3	3	6	3	6	3	6	6	2	3	6	4	5	6	5	7
300°	1	7	8	5	10	7	4	3	4	4	7	9	6	2	5	5	4	7	5	3	5	4	4	3
330°	4	7	11	9	10	7	6	7	3	6	6	7	5	5	6	8	10	8	8	4	4	5	8	4

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	1	1	1	0	1	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0
15	0	0	0	0	1	4	4	3	4	1	2	3	4	1	3	2	4	1	2	5	1	4	1	2
25	1	0	1	1	3	9	8	11	9	6	7	9	12	5	9	9	11	4	4	9	7	9	3	5
35	9	3	3	4	7	12	9	16	12	13	12	11	16	13	13	15	12	8	6	10	14	7	6	8
45	19	14	12	16	20	15	15	20	16	20	18	14	19	22	22	18	12	15	13	12	19	9	14	12
55	19	20	23	23	27	17	22	19	21	21	22	19	23	25	24	16	14	22	20	11	21	14	17	14
65	10	11	14	12	13	9	18	9	13	14	14	14	13	13	13	10	12	16	13	7	11	9	11	9
75	7	7	6	4	4	5	11	7	5	7	8	10	4	6	5	7	11	11	8	9	4	7	10	8
85	9	12	9	3	4	9	6	8	6	4	7	7	2	8	4	7	10	10	9	10	3	11	11	10
95	10	12	10	7	4	7	2	3	5	4	5	4	3	4	3	7	8	4	8	9	5	11	11	9
110	9	9	6	12	4	4	2	1	3	5	3	4	3	1	3	6	4	3	7	9	6	9	9	8
140	4	7	4	8	4	2	1	1	2	3	1	3	1	1	1	2	1	3	5	6	9	5	4	6
≥																								
160	3	5	12	10	8	6	1	2	3	2	1	2	0	0	0	0	0	3	4	2	4	5	3	9

FREIBURG AUGUST 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	3	4	12	8	7	3	6	4	4	5	8	9	7	11	14	16	9	7	4	3	3	7	4
30°	7	4	7	16	12	6	9	13	14	8	7	12	13	13	13	14	18	11	11	6	4	5	9	7
60°	10	5	8	12	11	10	17	21	27	18	16	18	15	15	10	11	20	18	18	14	9	8	12	9
90°	13	12	12	9	7	15	19	23	26	22	21	19	13	12	8	10	15	21	18	19	14	8	9	11
120°	15	20	18	8	6	11	9	16	13	19	17	14	9	6	5	9	8	16	12	16	14	5	6	12
150°	17	16	20	9	7	8	4	10	4	8	10	7	5	6	5	6	4	7	7	12	10	7	9	12
180°	13	7	13	6	7	8	6	5	2	2	7	5	6	9	8	3	2	1	3	5	9	14	15	13
210°	7	4	8	3	9	9	8	2	2	3	7	5	9	7	9	2	2	3	3	3	10	19	14	13
240°	2	9	5	3	9	7	8	2	2	3	4	4	7	6	8	4	2	4	6	4	7	16	7	9
270°	1	10	3	6	8	5	7	1	2	4	1	2	5	6	5	2	4	7	6	7	9	3	5	5
300°	4	7	1	8	9	6	6	0	2	5	1	2	4	7	7	9	2	2	4	6	8	4	3	3
330°	5	3	1	8	7	8	4	1	2	4	4	4	5	6	11	13	9	4	4	5	5	2	6	2

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	2	0	0	0
15	2	0	2	2	1	0	1	0	1	3	2	0	2	1	1	1	1	1	4	5	6	0	2	1
25	8	4	8	6	4	4	6	6	6	8	9	3	9	8	8	9	5	4	5	11	10	0	7	4
35	13	12	15	8	6	10	12	14	10	16	14	11	17	20	13	18	9	8	6	11	13	1	12	11
45	15	18	22	9	16	14	26	20	19	23	18	23	26	27	18	19	20	15	12	12	11	6	14	17
55	14	16	17	15	24	14	28	19	23	22	18	28	28	20	21	18	24	22	15	18	11	9	13	14
65	11	11	7	11	16	13	11	13	13	10	14	14	12	7	14	11	14	13	9	13	10	8	7	7
75	7	9	3	8	10	12	2	9	7	6	13	6	2	3	9	9	5	7	9	6	9	9	6	8
85	2	5	4	9	9	11	4	9	7	7	8	4	2	3	6	6	5	8	12	8	8	9	11	12
95	6	5	7	9	6	6	4	7	6	3	3	3	1	4	4	3	5	7	11	9	6	16	12	12
110	13	10	9	8	4	6	4	3	6	1	1	4	1	5	4	3	6	7	9	5	6	21	9	10
140	8	8	5	6	3	6	2	0	2	0	0	3	0	2	2	2	3	5	4	1	6	12	5	4
≥																								
160	1	2	1	9	1	4	0	0	0	0	0	1	0	0	0	1	3	3	3	0	2	9	2	0

FREIBURG SEPTEMBER 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	6	11	24	4	3	4	3	1	3	4	9	16	15	21	14	9	7	7	2	2	6	2	0
30°	0	0	10	6	6	3	6	6	3	2	5	5	12	14	17	16	13	12	9	5	1	3	2	2
60°	0	3	10	7	6	9	9	10	7	4	7	3	6	11	9	17	15	15	11	7	2	2	3	5
90°	0	10	10	17	6	15	11	13	13	7	6	3	3	4	3	13	17	17	11	11	10	3	3	3
120°	2	10	12	7	11	10	10	13	16	9	3	5	3	2	4	7	14	13	16	15	18	6	1	0
150°	6	3	13	0	12	8	8	14	14	14	6	9	2	2	5	4	9	9	20	16	21	17	7	2
180°	13	0	7	0	11	10	10	14	13	17	14	9	2	2	4	4	8	2	13	11	23	25	22	14
210°	24	9	0	6	8	11	13	10	13	14	16	9	6	7	3	4	5	3	9	17	17	29	27	
240°	21	22	2	16	11	9	12	4	10	11	14	12	11	6	2	3	3	5	1	7	5	6	20	26
270°	15	15	7	6	11	7	9	4	5	8	12	13	11	10	4	4	2	5	1	6	0	3	7	15
300°	11	9	10	3	8	8	4	5	3	6	8	12	13	10	5	2	6	3	6	0	6	2	6	
330°	6	13	8	8	6	7	4	4	2	5	5	11	16	14	18	9	3	6	5	5	1	6	2	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	1	0	0
15	0	0	0	0	0	1	0	2	1	3	4	3	2	4	3	1	3	5	4	6	2	4	0	3
25	2	6	0	0	0	5	0	5	4	7	8	8	6	7	10	3	7	8	13	12	10	9	3	12
35	6	16	0	8	2	8	1	4	9	10	10	10	9	10	13	8	01	9	15	15	16	10	11	12
45	13	24	12	25	15	16	13	12	18	17	15	17	16	17	16	17	17	12	18	13	21	16	21	11
55	16	29	22	25	22	20	26	20	24	19	19	19	21	21	19	21	22	16	19	12	21	22	24	10
65	11	12	12	12	11	11	18	13	13	9	9	10	12	13	11	14	13	10	11	11	13	13	18	10
75	6	0	2	9	0	5	10	13	7	3	7	7	7	9	6	10	7	7	4	11	6	6	12	15
85	13	0	3	4	4	6	9	15	7	8	9	8	11	8	9	9	6	9	4	10	5	7	6	16
95	13	3	5	0	15	10	9	9	5	10	7	7	8	4	5	7	6	9	6	6	4	7	2	9
110	8	7	12	0	17	10	9	4	5	9	6	6	4	2	2	5	6	8	4	2	2	4	2	2
140	8	3	15	0	6	5	4	2	4	4	4	3	2	1	1	2	3	4	2	0	0	1	1	0
≥ 160	4	0	17	17	8	3	1	1	3	0	1	2	2	3	5	3	0	3	0	0	0	0	0	0

FREIBURG OCTOBER 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	11	12	10	9	8	5	10	6	5	10	6	3	9	10	11	10	7	4	8	5	2	1	10	9
30°	7	12	8	12	10	7	10	9	8	9	6	2	7	6	7	6	11	10	8	8	2	3	6	5
60°	4	12	12	14	13	6	4	10	11	7	7	4	4	6	6	4	14	11	7	8	6	7	4	1
90°	4	8	8	12	16	6	4	10	12	8	9	6	3	4	5	9	12	11	7	8	10	8	7	0
120°	9	6	5	5	14	8	7	9	13	8	7	7	5	2	5	12	12	11	9	11	10	5	6	1
150°	9	12	8	3	7	7	8	7	8	9	10	9	6	3	6	11	9	10	12	14	14	7	4	7
180°	9	12	7	1	3	6	10	8	5	7	14	13	6	8	7	7	5	8	11	11	22	16	7	14
210°	12	4	7	5	3	13	10	9	8	9	15	17	9	12	7	6	6	8	9	11	17	18	15	19
240°	11	0	12	12	8	17	10	9	10	12	11	15	16	13	8	6	9	7	8	10	9	14	19	17
270°	4	2	8	11	10	12	10	9	8	10	7	11	16	12	11	6	5	8	8	6	3	11	12	12
300°	7	8	5	8	5	8	8	9	7	4	4	7	10	12	13	10	5	6	7	4	2	8	4	7
330°	13	12	10	8	3	5	9	5	5	7	4	6	9	12	14	13	5	6	6	4	3	2	6	8

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	1	0	1	0	1
15	0	2	2	0	0	0	2	0	1	1	1	4	1	2	4	2	2	5	5	5	2	5	3	8
25	2	4	5	1	2	2	7	2	1	4	3	7	6	8	8	6	6	13	12	11	6	9	11	20
35	9	8	5	7	5	6	10	6	4	9	4	11	11	13	10	9	7	12	17	14	10	14	20	20
45	25	29	10	15	5	10	12	12	12	17	16	19	21	20	16	13	10	12	19	16	20	19	23	15
55	30	40	18	22	3	12	13	12	16	20	27	24	26	28	23	18	14	14	18	17	25	19	15	18
65	12	17	13	19	5	7	11	7	11	11	17	13	14	14	12	10	9	10	8	13	14	10	6	8
75	2	0	12	11	7	6	12	6	9	6	11	6	6	4	3	8	8	3	3	7	7	6	5	0
85	4	0	15	4	8	12	10	11	12	7	9	4	6	3	5	11	10	4	6	5	9	7	5	0
95	4	0	10	4	17	12	7	12	12	6	4	3	4	3	7	10	10	8	7	5	6	5	4	1
10	5	0	7	6	19	11	7	12	11	6	3	4	3	3	7	7	8	11	3	5	1	2	4	4
140	5	0	3	6	12	6	4	11	6	6	3	3	1	1	3	3	8	6	1	1	0	2	3	4
≥																								
160	2	0	0	5	17	16	5	9	5	6	2	2	1	0	1	2	8	2	0	0	0	1	1	1

FREIBURG NOVEMBER 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	2	2	0	10	0	—	34	3	0	3	1	3	3	6	4	8	4	8	7	8	13	14	2
30°	0	3	7	5	25	0	—	8	3	0	4	1	1	2	2	6	8	8	5	4	4	3	0	5
60°	3	5	8	10	15	0	—	0	6	2	4	2	0	2	1	9	8	11	3	3	4	3	0	3
90°	8	5	5	5	0	0	—	8	16	12	10	7	1	5	4	11	10	10	5	3	4	7	6	2
120°	11	2	5	0	0	0	—	17	22	22	19	17	4	7	8	13	13	8	10	6	6	9	12	7
150°	21	5	0	0	12	0	—	8	14	21	24	21	12	6	9	10	11	8	12	9	10	15	7	16
180°	26	15	5	5	24	0	—	0	6	12	20	17	21	13	12	6	10	8	10	13	13	12	6	25
210°	17	23	17	14	14	0	—	0	6	8	7	16	23	23	18	9	9	9	12	20	16	3	12	19
240°	6	20	24	25	0	0	—	0	8	5	3	11	18	18	15	12	6	8	10	15	15	6	7	10
270°	5	12	16	25	0	25	—	0	9	7	4	4	9	10	9	10	4	8	7	7	6	13	0	8
300°	3	5	8	11	0	50	—	8	5	8	1	2	4	6	8	5	5	10	8	6	4	9	12	3
330°	0	3	3	0	0	25	—	17	2	3	1	1	4	5	8	5	8	8	10	7	10	7	24	0

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	7	0	—	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
15	0	0	0	0	19	0	—	0	2	0	0	0	0	1	1	2	0	3	3	3	0	3	0	0
25	0	0	3	0	18	0	—	0	5	0	1	1	1	5	5	5	3	7	19	12	8	9	0	0
35	0	3	14	0	6	0	—	0	5	2	4	3	3	10	9	8	9	8	32	23	18	11	0	6
45	0	12	25	25	7	13	—	17	13	12	13	10	10	12	15	11	18	11	23	24	16	12	0	21
55	0	23	20	50	19	25	—	33	24	20	20	14	16	16	18	12	23	14	8	18	8	10	29	23
65	12	20	6	25	18	12	—	17	13	16	11	13	17	13	12	7	13	13	3	10	8	6	46	11
75	29	12	10	0	6	0	—	0	5	16	7	17	16	7	10	9	4	12	5	6	12	10	25	5
85	18	11	10	0	0	0	—	0	5	15	12	16	13	7	10	13	2	8	5	3	12	10	0	9
95	12	8	15	0	0	0	—	8	5	10	14	12	10	10	7	11	5	8	2	0	12	6	0	13
110	20	4	7	0	0	13	—	17	8	7	11	9	9	10	6	8	11	11	0	0	6	10	0	10
140	9	3	0	0	0	25	—	8	8	2	6	4	4	6	4	6	8	5	0	0	0	10	0	2
≥																								
160	0	4	0	0	0	12	—	0	7	0	1	1	1	3	3	8	4	0	0	0	0	3	0	0

FREIBURG DECEMBER 1959

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	8	5	12	15	10	4	3	0	4	2	7	8	9	9	9	7	17	12	11	10	7	4	7	0
30°	6	5	11	13	21	7	7	0	3	2	6	5	8	9	7	9	15	13	10	5	5	4	8	0
60°	4	10	20	8	22	9	12	3	6	2	3	4	6	9	5	9	8	9	5	2	3	6	5	0
90°	4	12	9	2	11	4	8	5	12	6	3	4	6	9	8	9	6	8	4	8	3	11	7	11
120°	6	8	0	2	3	5	3	6	16	9	4	3	6	8	12	10	10	8	6	13	7	16	10	24
150°	11	10	3	8	3	11	5	8	19	11	6	3	7	5	15	8	10	10	13	13	16	12	8	13
180°	11	12	10	13	5	7	10	11	13	15	11	8	5	5	12	7	4	12	22	14	23	10	13	7
210°	10	8	10	8	6	11	19	17	4	18	21	14	6	9	5	8	3	9	17	11	12	13	22	9
240°	10	8	3	2	8	15	19	18	3	15	20	18	10	10	3	9	6	5	5	3	1	10	15	9
270°	10	8	3	2	8	11	10	16	7	9	10	14	14	10	5	9	6	3	0	4	4	7	3	11
300°	10	7	9	11	3	9	2	10	7	7	4	11	13	8	9	8	5	3	1	8	10	4	0	11
330°	10	7	10	16	0	7	2	6	6	4	5	8	10	9	10	7	10	8	6	9	9	3	2	5

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	1	0	0	3	0	3	0	2	1	0	0	0	0	0	1	1	1	1	2	1	4	0	0
25	6	5	3	0	5	2	6	0	3	1	1	1	0	1	0	5	3	4	5	4	3	8	6	2
35	12	10	8	6	3	4	5	0	2	1	2	3	1	2	1	6	8	8	8	4	5	6	13	9
45	15	18	14	13	12	5	9	3	9	4	4	6	6	10	10	9	15	11	11	11	9	9	16	23
55	18	20	13	6	22	9	14	5	19	8	6	8	10	17	18	11	18	14	11	14	9	12	13	27
65	18	18	6	2	16	14	14	6	9	5	7	7	8	12	13	8	11	12	15	12	8	10	6	16
75	17	12	13	6	3	20	17	11	2	6	11	8	10	10	10	5	6	8	21	11	13	15	6	9
85	10	6	23	13	0	18	16	21	11	14	16	13	14	10	9	8	9	9	13	11	22	16	15	5
95	3	3	17	18	3	12	11	25	18	18	17	16	13	9	11	11	11	12	5	11	21	11	15	2
110	1	3	3	19	12	9	5	18	12	20	16	18	14	11	13	15	9	8	5	8	9	7	8	5
140	0	3	0	13	14	5	0	8	6	15	11	12	12	11	10	11	4	4	4	4	0	2	2	2
≥																								
160	0	1	0	4	7	2	0	3	7	7	9	8	12	7	5	10	5	9	1	8	0	0	0	0

FREIBURG JANUARY 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	4	5	6	3	3	3	4	5	5	0	3	0	0	7	9	1	1	3	6	6	5	3	2
30°	4	6	6	3	1	3	3	9	6	10	3	9	2	1	3	7	3	1	5	10	5	3	1	3
60°	6	6	5	1	1	3	6	12	9	15	8	9	3	3	5	5	6	5	14	11	4	3	3	6
90°	6	5	4	0	2	3	10	7	11	10	8	3	9	7	5	8	4	10	16	7	7	5	4	4
120°	6	7	4	2	2	3	10	3	10	5	3	6	16	13	7	11	6	12	10	9	14	7	4	4
150°	6	6	6	4	3	6	7	4	11	15	8	16	11	10	10	12	13	12	10	16	17	11	8	12
180°	15	5	9	7	5	9	6	10	13	15	19	16	6	4	12	12	17	13	8	18	15	17	17	21
210°	25	12	15	15	12	11	9	12	10	5	21	16	9	7	11	11	10	14	6	12	8	22	20	25
240°	18	21	20	21	24	17	15	13	6	5	14	16	14	14	7	5	6	11	7	5	2	16	12	16
270°	4	16	14	18	26	21	17	13	7	10	8	6	14	17	7	4	10	7	7	1	4	4	8	5
300°	2	8	8	13	16	15	10	9	7	5	5	0	14	17	12	7	15	8	7	1	9	2	11	1
330°	4	4	4	10	5	6	4	4	5	0	3	0	5	7	14	9	9	6	7	4	9	5	9	1

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	2	0	3	1	2	0	0	0	0	0	0	7	0	0	0	0	2	2	0	0	2	3	0	1
25	4	1	8	3	3	2	1	0	0	0	0	14	0	1	0	1	3	5	2	2	6	6	2	4
35	6	7	13	5	3	3	2	1	0	0	0	11	0	3	3	3	2	2	9	5	6	4	5	7
45	10	18	15	10	4	4	5	5	1	0	3	14	6	8	11	5	5	6	11	9	8	7	9	9
55	12	14	11	15	6	5	6	6	3	0	8	19	12	13	12	9	9	13	0	11	12	12	10	9
65	8	6	6	9	5	5	4	4	2	0	10	7	6	9	5	7	8	8	2	10	8	8	9	7
75	7	4	3	7	9	7	7	4	5	0	8	0	0	5	2	4	11	4	2	10	7	10	9	6
85	9	5	4	9	14	7	12	6	11	15	8	7	0	9	7	1	12	6	7	10	10	12	5	6
95	11	11	10	14	21	14	15	17	19	35	12	14	5	19	11	7	12	15	14	10	13	12	10	15
110	15	16	13	17	21	25	18	25	28	25	16	7	19	19	18	21	17	22	16	12	17	16	20	23
140	10	9	8	9	9	18	11	16	22	10	19	0	27	9	19	24	12	12	11	12	10	9	13	12
≥																								
160	6	9	5	1	3	10	19	16	9	15	16	0	25	5	12	18	7	5	17	9	1	1	8	1

FREIBURG FEBRUARY 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	4	6	6	7	6	5	6	7	0	0	0	2	2	4	4	15	8	1	2	4	6	3	7	4
30°	2	6	5	9	6	6	9	7	9	0	0	0	0	4	2	5	11	3	6	7	7	3	7	4
60°	3	6	6	7	3	7	7	5	20	0	0	0	0	6	11	10	8	9	13	9	6	7	4	4
90°	3	4	5	4	2	4	7	10	21	6	0	0	2	7	18	5	3	10	13	7	4	7	6	3
120°	4	4	5	4	3	1	10	20	16	19	6	3	10	12	15	0	0	11	6	9	2	4	9	3
150°	9	9	6	7	6	3	9	19	9	25	20	17	16	16	4	5	3	13	7	11	14	10	11	9
180°	16	15	10	10	10	7	7	10	7	25	11	24	15	11	4	10	8	8	13	18	29	19	14	19
210°	16	14	12	12	12	14	9	3	7	19	13	17	10	5	8	5	14	5	10	17	19	18	13	20
240°	10	9	17	15	13	20	9	0	2	6	16	14	8	6	4	0	17	3	6	7	6	12	12	14
270°	10	9	15	13	18	18	10	3	2	0	15	11	12	11	4	0	14	9	9	3	4	7	9	11
300°	12	10	8	6	13	9	10	8	5	0	13	6	15	11	13	15	8	18	10	4	1	5	4	6
330°	11	8	5	6	8	6	7	8	2	0	6	6	10	7	13	30	6	10	5	4	2	5	4	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
15	4	1	0	1	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	0	1	2	3	4
25	4	3	1	6	0	2	0	0	0	0	0	0	0	1	2	10	1	4	1	0	3	6	7	6
35	6	7	1	9	2	1	1	2	2	0	0	0	2	4	9	5	6	7	3	1	1	9	12	6
45	10	10	7	7	11	7	10	6	5	6	8	8	12	10	13	5	6	10	7	7	6	10	14	6
55	9	12	15	6	15	13	17	6	2	12	17	14	20	12	9	10	6	12	9	10	12	10	11	6
65	5	10	13	6	8	8	12	4	0	6	8	14	12	8	5	5	9	6	9	7	7	7	7	4
75	5	8	11	7	4	7	12	6	5	6	8	15	11	8	5	5	14	1	12	6	6	8	10	7
85	6	10	9	6	6	10	10	6	11	20	17	10	11	10	5	10	9	4	11	8	14	10	6	10
95	12	10	10	12	13	15	11	10	25	20	17	10	11	13	13	15	9	13	13	15	20	12	6	16
110	19	10	16	21	19	20	17	19	29	12	17	13	14	18	21	20	17	22	20	21	15	15	12	18
140	12	8	10	12	12	12	9	20	16	12	8	8	7	11	11	10	17	14	13	13	7	9	8	11
≥																								
160	7	11	7	7	10	4	1	21	7	6	0	8	0	5	7	0	6	7	2	12	8	2	4	5

FREIBURG MARCH 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	5	4	8	6	3	10	9	9	9	0	—	—	—	—	—	—	0	18	15	6	5	6	3	8
30°	5	5	7	4	4	10	9	11	25	12	—	—	—	—	—	—	0	15	8	4	4	5	6	7
60°	6	4	4	3	6	6	7	13	12	25	—	—	—	—	—	—	0	4	1	3	5	2	7	5
90°	5	4	2	3	6	2	8	9	8	13	—	—	—	—	—	—	0	2	5	10	8	5	6	4
120°	7	7	2	2	2	2	9	8	3	0	—	—	—	—	—	—	8	6	11	16	12	10	7	5
150°	10	9	7	2	1	3	6	11	6	0	—	—	—	—	—	—	17	8	12	12	15	14	11	11
180°	11	12	13	8	4	3	2	9	17	0	—	—	—	—	—	—	16	11	11	9	15	16	14	13
210°	11	16	17	18	12	9	3	5	6	12	—	—	—	—	—	—	26	13	6	8	12	12	11	13
240°	11	17	17	20	23	18	10	6	3	25	—	—	—	—	—	—	25	8	4	8	10	7	13	12
270°	11	11	11	13	21	18	16	8	8	13	—	—	—	—	—	—	8	2	6	8	6	7	13	5
300°	10	7	5	11	13	11	12	5	3	0	—	—	—	—	—	—	0	2	8	8	4	9	7	6
330°	8	4	7	10	5	8	9	6	0	0	—	—	—	—	—	—	0	11	13	8	4	7	2	7

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	1	0	1	1	0	0	0	0	0	—	—	—	—	—	—	0	0	0	1	0	0	0	1
15	2	6	3	3	3	2	1	0	0	0	—	—	—	—	—	—	0	0	1	8	2	2	6	4
25	5	12	9	9	7	6	3	0	0	0	—	—	—	—	—	—	0	0	3	13	7	7	17	8
35	9	10	11	13	10	8	5	2	0	0	—	—	—	—	—	—	0	2	9	11	10	10	17	8
45	15	15	20	18	16	16	14	11	6	13	—	—	—	—	—	—	0	8	15	13	16	13	14	12
55	17	23	24	20	22	20	22	19	17	25	—	—	—	—	—	—	0	10	21	14	21	12	16	19
65	10	14	11	12	11	12	14	11	9	12	—	—	—	—	—	—	0	4	13	10	13	8	10	10
75	3	6	4	3	7	10	7	3	14	0	—	—	—	—	—	—	0	2	2	7	7	4	1	3
85	5	5	4	2	9	8	6	9	20	13	—	—	—	—	—	—	0	6	4	4	6	8	1	5
95	10	2	4	6	7	5	7	17	12	25	—	—	—	—	—	—	8	12	8	5	6	12	4	9
110	12	3	6	8	4	7	11	14	16	12	—	—	—	—	—	—	17	16	7	8	6	12	9	11
140	8	2	3	4	2	5	7	6	6	0	—	—	—	—	—	—	16	10	5	4	3	7	4	5
≥																								
160	3	1	1	1	1	1	3	8	0	0	—	—	—	—	—	—	59	30	12	2	3	5	1	5

FREIBURG APRIL 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	15	10	9	11	13	17	19	17	—	—	—	—	—	—	—	—	50	13	13	10	9	10	5	15
30°	9	8	7	9	11	11	11	11	—	—	—	—	—	—	—	—	13	18	13	6	7	8	3	9
60°	4	5	8	5	5	6	3	9	—	—	—	—	—	—	—	—	0	19	9	6	5	6	4	2
90°	3	7	9	4	2	6	4	22	—	—	—	—	—	—	—	—	0	7	7	6	6	4	7	3
120°	5	9	9	8	2	4	10	23	—	—	—	—	—	—	—	—	0	6	7	10	8	4	8	7
150°	9	10	6	1	3	3	13	7	—	—	—	—	—	—	—	—	0	12	5	12	9	6	9	10
180°	9	8	6	11	5	4	10	0	—	—	—	—	—	—	—	—	0	7	5	9	7	9	9	10
210°	8	5	8	19	6	7	3	0	—	—	—	—	—	—	—	—	0	0	11	6	5	11	7	6
240°	9	8	9		10	8	1	0	—	—	—	—	—	—	—	—	0	0	11	5	6	11	9	6
270°	8	10	9	9	15	9	3	0	—	—	—	—	—	—	—	—	0	0	5	6	11	9	12	10
300°	8	10	10	9	15	11	7	3	—	—	—	—	—	—	—	—	12	6	5	10	15	11	15	10
330°	13	10	10	10	13	14	16	8	—	—	—	—	—	—	—	—	25	12	9	14	12	11	12	12

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	1	1	1	1	1	0	0	—	—	—	—	—	—	—	—	0	0	0	1	2	1	1	3
15	5	5	6	5	3	2	3	0	—	—	—	—	—	—	—	—	0	0	7	4	8	7	4	8
25	14	10	13	11	5	3	6	0	—	—	—	—	—	—	—	—	0	7	16	11	11	12	9	10
35	15	10	12	10	5	10	6	3	—	—	—	—	—	—	—	—	0	12	12	15	7	12	8	9
45	14	13	15	14	13	23	16	8	—	—	—	—	—	—	—	—	0	20	18	21	10	15	14	12
55	17	17	17	19	22	29	25	3	—	—	—	—	—	—	—	—	0	24	26	20	17	16	12	16
65	12	10	10	11	14	13	12	0	—	—	—	—	—	—	—	—	0	12	12	9	10	8	12	9
75	6	5	7	4	5	3	2	7	—	—	—	—	—	—	—	—	0	0	0	4	6	1	4	5
85	3	6	6	3	6	3	6	20	—	—	—	—	—	—	—	—	25	0	0	3	7	2	4	4
95	2	7	5	5	8	3	12	23	—	—	—	—	—	—	—	—	50	7	2	3	8	7	6	6
110	4	8	4	9	8	4	8	27	—	—	—	—	—	—	—	—	25	12	4	4	8	8	7	9
140	4	4	2	5	4	3	3	9	—	—	—	—	—	—	—	—	0	6	3	3	4	5	6	6
≥																								
160	4	4	2	3	6	3	1	0	—	—	—	—	—	—	—	—	0	0	0	2	2	6	4	3

FREIBURG MAY 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	12	9	10	10	5	25	—	—	—	—	—	—	—	—	—	—	—	—	—	25	18	17	10	15
30°	6	10	14	7	4	8	—	—	—	—	—	—	—	—	—	—	—	—	—	16	16	11	6	11
60°	3	9	10	7	8	4	—	—	—	—	—	—	—	—	—	—	—	—	—	3	8	3	3	8
90°	4	5	7	13	16	9	—	—	—	—	—	—	—	—	—	—	—	—	—	0	3	1	10	5
120°	10	5	11	16	13	8	—	—	—	—	—	—	—	—	—	—	—	—	—	0	6	3	20	4
150°	15	8	11	11	6	9	—	—	—	—	—	—	—	—	—	—	—	—	—	0	8	10	14	6
180°	11	9	4	4	7	4	—	—	—	—	—	—	—	—	—	—	—	—	—	3	6	18	4	7
210°	10	11	4	3	11	8	—	—	—	—	—	—	—	—	—	—	—	—	—	8	8	12	4	5
240°	6	14	8	7	11	17	—	—	—	—	—	—	—	—	—	—	—	—	—	3	6	5	4	1
270°	4	11	7	9	8	8	—	—	—	—	—	—	—	—	—	—	—	—	—	3	2	1	4	5
300°	7	5	7	6	6	0	—	—	—	—	—	—	—	—	—	—	—	—	—	14	5	5	9	14
330°	12	5	7	7	5	0	—	—	—	—	—	—	—	—	—	—	—	—	—	26	14	14	12	19

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	1	8	0	0	—	—	—	—	—	—	—	—	—	—	—	—	—	6	2	4	1	2
15	1	2	7	20	2	8	—	—	—	—	—	—	—	—	—	—	—	—	—	16	9	11	9	9
25	4	9	12	20	8	18	—	—	—	—	—	—	—	—	—	—	—	—	—	9	18	11	15	14
35	7	14	10	18	11	12	—	—	—	—	—	—	—	—	—	—	—	—	—	11	16	6	9	11
45	18	18	11	18	12	20	—	—	—	—	—	—	—	—	—	—	—	—	—	21	14	12	12	11
55	26	22	16	12	13	30	—	—	—	—	—	—	—	—	—	—	—	—	—	28	18	18	23	11
65	12	12	10	4	7	12	—	—	—	—	—	—	—	—	—	—	—	—	—	9	11	10	13	6
75	0	3	6	0	4	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	5	4	1	5
85	4	1	7	0	4	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	5	4	1	6
95	12	5	6	0	8	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	2	5	6	5
110	12	9	7	0	14	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	8	7	8
140	4	5	6	0	10	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	6	3	9
≥																								
160	0	0	1	0	7	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	1	0	3

FREIBURG JUNE 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	11	10	11	12	15	11	—	—	—	—	—	—	—	—	—	—	—	—	—	13	15	10	6	10
30°	10	9	7	10	12	13	—	—	—	—	—	—	—	—	—	—	—	—	—	0	5	8	5	11
60°	6	6	6	5	10	8	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	7	4	9
90°	4	6	6	5	9	7	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	6	3	5
120°	5	8	5	8	8	10	—	—	—	—	—	—	—	—	—	—	—	—	—	12	15	7	5	4
150°	10	8	10	9	11	8	—	—	—	—	—	—	—	—	—	—	—	—	—	25	35	8	6	5
180°	12	10	13	10	11	5	—	—	—	—	—	—	—	—	—	—	—	—	—	13	25	8	4	7
210°	11	10	11	10	6	7	—	—	—	—	—	—	—	—	—	—	—	—	—	0	5	6	8	9
240°	8	6	7	8	1	8	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	4	14	8
270°	7	7	6	6	1	7	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	9	17	8
300°	7	10	7	7	5	10	—	—	—	—	—	—	—	—	—	—	—	—	—	12	0	14	17	11
330°	9	10	11	10	11	6	—	—	—	—	—	—	—	—	—	—	—	—	—	25	0	13	11	13

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	2	2	1	2	1	0	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	4	4	5
15	7	9	11	7	6	0	—	—	—	—	—	—	—	—	—	—	—	—	—	13	0	18	14	14
25	10	11	18	12	14	3	—	—	—	—	—	—	—	—	—	—	—	—	—	38	7	24	18	14
35	8	7	13	9	12	5	—	—	—	—	—	—	—	—	—	—	—	—	—	37	12	14	14	10
45	13	12	13	11	19	8	—	—	—	—	—	—	—	—	—	—	—	—	—	12	6	12	13	11
55	21	22	14	16	22	10	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	13	15	11
65	12	13	8	11	10	4	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	6	7	5
75	6	4	3	5	1	6	—	—	—	—	—	—	—	—	—	—	—	—	—	0	15	1	3	5
85	9	5	4	3	3	13	—	—	—	—	—	—	—	—	—	—	—	—	—	0	23	1	4	8
95	7	5	5	4	5	18	—	—	—	—	—	—	—	—	—	—	—	—	—	0	19	2	3	9
110	3	5	5	8	4	16	—	—	—	—	—	—	—	—	—	—	—	—	—	0	12	2	2	6
140	1	2	3	5	2	7	—	—	—	—	—	—	—	—	—	—	—	—	—	0	6	2	2	2
≥																								
160	1	3	3	7	1	10	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	1	1	0

FREIBURG JULY 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	3	5	6	7	6	7	0	0	25	—	—	—	—	—	—	—	—	—	7	25	19	9	3	8
30°	6	5	9	9	9	6	0	0	0	—	—	—	—	—	—	—	—	—	0	13	14	9	2	10
60°	11	9	10	10	10	11	0	0	0	—	—	—	—	—	—	—	—	—	0	0	7	8	5	10
90°	9	9	5	8	8	9	0	0	0	—	—	—	—	—	—	—	—	—	8	0	6	5	7	7
120°	6	7	3	6	6	6	8	0	0	—	—	—	—	—	—	—	—	—	18	0	6	4	7	5
150°	7	5	6	7	8	5	25	12	0	—	—	—	—	—	—	—	—	—	8	0	5	5	7	8
180°	10	6	8	7	8	5	26	25	0	—	—	—	—	—	—	—	—	—	0	12	6	10	7	10
210°	10	12	8	9	8	5	8	13	0	—	—	—	—	—	—	—	—	—	0	25	7	16	9	13
240°	10	14	9	10	10	6	8	0	0	—	—	—	—	—	—	—	—	—	0	13	7	12	14	12
270°	11	10	13	11	11	9	17	12	0	—	—	—	—	—	—	—	—	—	8	0	5	5	15	7
300°	10	9	13	9	10	16	8	25	25	—	—	—	—	—	—	—	—	—	25	0	5	7	14	4
330°	7	9	10	7	6	15	0	13	50	—	—	—	—	—	—	—	—	—	25	12	13	10	10	6

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	0	2	1	0	0	0	0	0	—	—	—	—	—	—	—	—	—	0	0	1	1	2	1
15	7	3	6	3	2	4	0	0	25	—	—	—	—	—	—	—	—	—	0	0	6	4	8	1
25	13	9	7	6	6	10	0	0	50	—	—	—	—	—	—	—	—	—	0	0	12	9	10	2
35	12	10	9	7	9	9	0	0	25	—	—	—	—	—	—	—	—	—	0	0	15	15	18	5
45	12	15	16	12	17	16	0	13	0	—	—	—	—	—	—	—	—	—	8	13	11	16	12	15
55	16	20	18	18	19	23	0	25	0	—	—	—	—	—	—	—	—	—	17	38	11	11	14	22
65	8	14	10	12	12	12	0	12	0	—	—	—	—	—	—	—	—	—	8	37	7	9	9	12
75	4	9	7	9	12	6	0	0	0	—	—	—	—	—	—	—	—	—	0	12	2	10	5	6
85	7	8	9	8	10	7	8	0	0	—	—	—	—	—	—	—	—	—	16	0	7	8	10	10
95	9	5	8	7	5	5	25	0	0	—	—	—	—	—	—	—	—	—	35	0	10	6	12	10
110	8	5	4	9	4	5	34	13	0	—	—	—	—	—	—	—	—	—	16	0	8	4	7	6
140	3	2	1	6	3	3	25	25	0	—	—	—	—	—	—	—	—	—	0	0	7	2	2	4
≥ 160	0	0	3	2	1	0	8	12	0	—	—	—	—	—	—	—	—	—	0	0	3	5	1	6

FREIBURG AUGUST 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	4	5	9	4	6	0	0	—	—	—	—	—	—	—	—	—	—	26	5	3	9	3	8
30°	8	6	8	6	9	9	0	25	—	—	—	—	—	—	—	—	—	—	8	0	10	7	12	7
60°	6	4	7	5	12	17	15	50	—	—	—	—	—	—	—	—	—	—	8	5	15	3	15	4
90°	4	6	3	6	11	14	30	25	—	—	—	—	—	—	—	—	—	—	17	15	16	3	12	5
120°	4	8	1	6	10	7	15	0	—	—	—	—	—	—	—	—	—	—	8	15	6	12	10	9
150°	6	4	3	5	7	3	0	0	—	—	—	—	—	—	—	—	—	—	8	5	3	18	8	11
180°	8	4	5	6	7	0	0	0	—	—	—	—	—	—	—	—	—	—	17	0	7	12	7	12
210°	13	14	13	9	7	4	5	0	—	—	—	—	—	—	—	—	—	—	8	5	9	6	10	12
240°	19	22	21	13	9	10	10	0	—	—	—	—	—	—	—	—	—	—	0	15	12	7	13	12
270°	15	17	20	13	11	10	10	0	—	—	—	—	—	—	—	—	—	—	0	15	9	3	8	8
300°	7	8	10	11	9	10	10	0	—	—	—	—	—	—	—	—	—	—	0	10	7	6	2	5
330°	4	3	4	11	4	10	5	0	—	—	—	—	—	—	—	—	—	—	0	10	3	14	0	7

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	0	0	0	0	4	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	
15	4	4	0	3	5	3	0	0	—	—	—	—	—	—	—	—	—	—	0	10	0	0	0	0
25	6	10	3	11	15	4	4	0	—	—	—	—	—	—	—	—	—	—	0	20	6	6	2	8
35	6	11	9	14	18	6	9	0	—	—	—	—	—	—	—	—	—	—	0	15	13	15	8	9
45	9	17	18	18	16	16	12	25	—	—	—	—	—	—	—	—	—	—	16	15	14	15	17	9
55	13	21	21	21	16	23	17	50	—	—	—	—	—	—	—	—	—	—	35	15	19	10	15	8
65	9	10	13	11	11	13	12	25	—	—	—	—	—	—	—	—	—	—	24	10	12	9	5	1
75	8	4	8	4	5	9	0	—	—	—	—	—	—	—	—	—	—	—	17	10	10	16	2	8
85	10	7	12	7	3	3	8	0	—	—	—	—	—	—	—	—	—	—	8	5	13	16	10	19
95	10	9	12	6	4	4	13	0	—	—	—	—	—	—	—	—	—	—	0	0	10	10	17	13
110	10	6	4	2	5	10	12	0	—	—	—	—	—	—	—	—	—	—	0	0	3	3	13	15
140	6	1	0	2	2	7	4	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	8	5
≥																								1
160	8	0	0	1	0	1	0	0	—	—	—	—	—	—	—	—	—	—	0	0	0	0	3	4

FREIBURG SEPTEMBER 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	7	4	15	9	6	9	8	0	—	—	—	—	—	—	—	—	—	18	0	0	4	9	3	8
30°	5	5	13	10	9	6	9	0	—	—	—	—	—	—	—	—	—	13	3	4	3	9	3	4
60°	3	6	9	7	9	3	8	12	—	—	—	—	—	—	—	—	—	12	5	8	5	6	3	3
90°	2	7	8	4	7	6	8	37	—	—	—	—	—	—	—	—	—	7	6	11	5	4	4	3
120°	3	10	7	9	6	8	9	38	—	—	—	—	—	—	—	—	—	0	8	13	9	6	8	2
150°	5	7	6	10	6	9	8	13	—	—	—	—	—	—	—	—	—	0	8	13	20	11	11	2
180°	6	6	7	5	6	11	8	0	—	—	—	—	—	—	—	—	—	0	3	14	23	18	11	3
210°	10	7	7	8	10	12	8	0	—	—	—	—	—	—	—	—	—	6	12	13	14	11	12	9
240°	14	10	6	10	13	10	9	0	—	—	—	—	—	—	—	—	—	12	21	8	5	9	12	20
270°	17	14	6	10	13	10	9	0	—	—	—	—	—	—	—	—	—	13	18	8	2	9	12	21
300°	15	15	6	10	9	8	8	0	—	—	—	—	—	—	—	—	—	12	10	6	4	4	12	14
330°	13	9	10	8	6	8	8	0	—	—	—	—	—	—	—	—	—	7	6	2	6	4	9	11

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	1	3	0	0	1	0	0	—	—	—	—	—	—	—	—	—	0	0	0	0	1	2	1
15	6	6	9	1	3	2	1	0	—	—	—	—	—	—	—	—	—	0	6	4	2	4	4	7
25	11	18	15	8	10	4	2	0	—	—	—	—	—	—	—	—	—	0	10	8	7	7	9	12
35	11	20	14	11	12	6	5	0	—	—	—	—	—	—	—	—	—	0	4	11	8	9	13	11
45	17	18	15	13	14	12	13	0	—	—	—	—	—	—	—	—	—	21	12	23	15	14	14	12
55	24	14	17	16	17	18	20	0	—	—	—	—	—	—	—	—	—	43	20	27	24	18	13	16
65	11	6	10	12	10	11	11	0	—	—	—	—	—	—	—	—	—	30	11	11	15	9	9	8
75	4	2	6	9	7	3	9	0	—	—	—	—	—	—	—	—	—	6	8	0	7	6	7	3
85	6	6	5	10	10	3	11	0	—	—	—	—	—	—	—	—	—	0	7	2	5	8	7	8
95	5	5	3	8	8	9	12	13	—	—	—	—	—	—	—	—	—	0	0	6	4	7	7	7
110	3	3	2	6	5	16	11	38	—	—	—	—	—	—	—	—	—	0	5	6	7	7	8	6
140	1	1	1	3	3	10	5	37	—	—	—	—	—	—	—	—	—	0	8	2	5	6	4	4
≥																								
160	0	0	0	3	1	5	0	12	—	—	—	—	—	—	—	—	—	0	9	0	1	4	3	5

FREIBURG OCTOBER 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	5	6	6	8	6	7	9	5	18	0	—	—	—	—	17	20	0	5	6	6	3	5	6
30°	4	8	5	6	6	7	7	14	5	7	0	—	—	—	—	16	15	6	4	5	7	6	6	8
60°	3	8	5	3	4	6	8	18	10	0	0	—	—	—	—	7	10	15	8	6	10	7	7	10
90°	2	5	4	1	3	5	9	15	10	6	12	—	—	—	—	2	20	15	10	10	14	10	9	8
120°	4	3	3	1	3	5	6	10	15	12	25	—	—	—	—	7	25	8	9	13	13	10	8	6
150°	7	7	4	5	3	5	3	5	15	13	25	—	—	—	—	7	10	6	10	14	10	7	7	7
180°	9	10	8	8	7	6	2	3	5	12	25	—	—	—	—	5	0	13	15	11	9	7	10	10
210°	14	11	13	14	14	9	7	6	0	13	13	—	—	—	—	7	0	15	15	10	10	12	12	8
240°	19	17	19	22	19	15	14	6	5	12	0	—	—	—	—	7	0	10	10	10	10	12	13	10
270°	17	14	17	18	14	16	18	3	10	7	0	—	—	—	—	2	0	8	5	5	7	12	12	16
300°	9	8	9	10	10	13	13	4	10	0	0	—	—	—	—	7	0	4	4	4	2	10	7	8
330°	6	4	7	6	9	7	6	7	10	0	0	—	—	—	—	16	0	0	5	6	2	4	4	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	1	2	0	0	1	0	0	0	0	0	—	—	—	—	0	0	0	0	1	0	1	2	4
15	10	10	8	6	6	3	2	2	0	0	0	—	—	—	—	0	0	2	5	4	4	7	11	16
25	19	20	15	14	15	8	6	5	0	0	0	—	—	—	—	0	0	4	14	7	11	15	18	21
35	16	20	15	17	15	14	8	7	0	0	0	—	—	—	—	5	5	8	16	7	11	16	15	15
45	13	17	14	15	15	20	16	14	11	7	25	—	—	—	—	18	25	21	18	13	14	16	17	23
55	19	15	11	12	15	25	23	19	20	12	50	—	—	—	—	23	35	24	22	20	19	16	20	13
65	11	6	8	8	8	11	13	11	11	6	25	—	—	—	—	11	15	13	14	11	13	9	10	6
75	3	1	6	6	4	1	6	9	5	0	0	—	—	—	—	7	5	8	4	3	7	4	2	4
85	4	2	5	3	5	3	6	11	10	0	0	—	—	—	—	9	10	6	2	4	6	3	1	3
95	3	2	5	4	6	5	6	9	10	21	0	—	—	—	—	9	5	4	2	8	4	4	1	2
110	1	2	6	7	6	4	7	9	14	36	0	—	—	—	—	9	0	4	2	10	6	6	2	2
140	0	1	3	4	5	3	4	4	14	18	0	—	—	—	—	7	0	4	1	7	2	3	1	1
≥																								
160	0	3	2	4	1	2	3	0	5	0	0	—	—	—	—	2	0	2	0	5	3	0	0	0

FREIBURG NOVEMBER 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	1	7	4	5	9	3	10	8	8	8	—	—	—	—	—	0	8	6	10	5	2	1	3	0
30°	2	8	3	2	8	6	6	7	7	12	—	—	—	—	—	0	8	7	12	5	5	3	5	3
60°	4	6	2	1	7	9	5	4	4	18	—	—	—	—	—	0	8	5	8	8	12	7	7	9
90°	7	3	2	2	4	7	4	10	10	16	—	—	—	—	—	0	5	3	10	11	16	12	11	11
120°	9	3	1	2	1	4	1	17	17	10	—	—	—	—	—	0	2	6	10	9	11	13	14	12
150°	9	2	4	2	1	2	4	11	11	8	—	—	—	—	—	8	6	10	3	7	6	10	13	18
180°	13	6	8	1	4	3	9	6	6	6	—	—	—	—	—	17	17	9	3	7	7	8	11	19
210°	17	20	10	8	16	11	12	6	6	2	—	—	—	—	—	17	17	9	12	10	15	12	8	11
240°	18	25	19	25	22	23	16	8	8	2	—	—	—	—	—	25	8	15	16	14	15	16	6	5
270°	13	12	24	29	16	21	15	10	10	6	—	—	—	—	—	25	5	15	8	12	8	13	9	4
300°	6	4	16	16	6	9	8	7	7	6	—	—	—	—	—	8	8	9	3	7	2	5	9	5
330°	1	4	7	7	6	2	8	6	6	6	—	—	—	—	—	0	8	6	5	5	1	0	4	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	1	0	0	0	0	1	0	0	—	—	—	—	—	0	0	0	0	0	0	0	0	0
15	4	8	4	2	7	0	2	2	0	0	—	—	—	—	—	0	7	2	2	2	6	2	1	0
25	10	18	9	5	16	2	4	3	1	0	—	—	—	—	—	0	17	6	7	9	13	6	4	0
35	13	16	12	7	16	7	4	6	4	0	—	—	—	—	—	0	12	8	12	12	13	9	7	3
45	15	14	15	14	15	14	11	10	10	6	—	—	—	—	—	8	7	16	16	16	13	13	19	20
55	17	16	16	18	15	17	19	15	13	15	—	—	—	—	—	25	7	22	18	21	15	14	27	31
65	8	7	10	11	6	9	14	13	9	13	—	—	—	—	—	34	7	17	10	13	11	9	13	18
75	6	3	9	7	1	6	13	8	6	8	—	—	—	—	—	25	13	6	5	8	9	7	5	6
85	7	6	9	7	2	9	13	8	9	10	—	—	—	—	—	8	16	6	7	11	9	9	10	6
95	7	6	6	10	6	10	9	11	10	15	—	—	—	—	—	0	9	7	8	7	4	11	8	8
110	9	4	6	13	7	10	7	10	12	19	—	—	—	—	—	0	4	6	10	1	2	10	4	6
140	4	2	3	6	6	7	4	6	12	12	—	—	—	—	—	0	1	3	5	0	2	6	2	2
≥																								
160	0	0	0	0	3	9	0	7	14	2	—	—	—	—	—	0	0	1	0	0	3	4	0	0

FREIBURG DECEMBER 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	2	6	7	8	4	6	3	4	4	6	12	4	5	8	5	6	9	3	5	2	4	4	3	8
30°	2	6	4	8	8	5	7	2	4	8	12	5	5	8	7	8	10	6	6	1	2	5	6	5
60°	2	4	5	5	9	6	9	4	5	9	9	4	5	8	9	13	10	10	9	1	1	10	9	5
90°	4	3	5	3	6	8	10	11	12	12	6	4	4	10	10	14	9	12	16	9	6	10	8	5
120°	6	3	5	2	5	8	8	14	20	11	7	9	9	9	10	11	11	16	22	19	17	6	4	4
150°	6	3	6	1	2	5	7	10	15	6	9	13	10	8	11	6	10	15	16	20	23	10	5	5
180°	6	6	7	3	1	3	7	8	9	5	10	14	11	12	10	4	7	9	9	16	19	15	10	9
210°	10	12	11	12	13	9	8	9	7	12	8	18	16	12	8	7	4	4	3	11	10	15	12	13
240°	19	18	16	23	27	17	13	12	9	15	6	13	17	10	7	11	4	4	3	9	3	11	12	15
270°	22	18	16	18	18	15	16	12	8	9	6	7	10	6	7	9	6	6	5	4	4	6	15	14
300°	15	13	10	11	5	10	9	8	4	4	6	5	4	4	8	6	10	9	3	4	6	3	11	9
330°	6	8	8	6	2	8	3	6	3	3	9	4	4	5	8	5	10	6	3	4	5	4	5	8

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
15	3	2	3	1	1	1	0	0	1	0	0	0	0	0	0	1	2	2	0	0	0	1	5	5
25	5	8	8	1	2	2	1	0	3	0	0	0	0	0	0	2	6	4	0	1	0	2	8	10
35	8	10	10	1	2	5	3	0	4	0	0	0	1	0	1	2	8	4	1	1	1	4	6	12
45	15	16	11	12	5	11	9	8	9	6	2	3	2	2	4	6	10	10	5	7	10	7	11	15
55	22	18	15	26	11	16	11	17	14	12	4	7	2	4	6	12	13	18	9	13	15	11	16	14
65	13	11	9	13	10	11	8	12	8	8	2	6	1	6	5	10	11	11	9	9	12	9	9	9
75	8	8	6	7	7	5	9	10	5	5	5	1	1	7	10	9	8	7	10	7	12	4	6	9
85	6	9	6	10	13	8	10	10	7	9	13	3	6	10	15	12	10	6	12	10	12	10	9	8
95	5	6	8	10	15	9	14	10	10	16	19	10	16	18	17	14	14	10	15	16	12	19	10	5
110	8	6	12	9	21	11	19	12	15	22	22	22	27	20	20	14	11	14	19	22	13	19	10	5
140	5	3	8	6	12	11	10	10	14	16	21	28	21	14	16	12	4	9	13	13	9	11	6	4
≥																								
160	1	3	3	4	1	9	6	11	10	6	12	20	23	19	6	6	3	5	7	1	4	3	3	3

2.5. HALLEY BAY SPRING 1958*

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	0	0	0	0	0	5	0	0	0	0	0	—	—	—	—
30°	—	—	—	—	—	—	—	—	—	0	0	0	0	14	5	7	6	8	0	14	—	—	—	—
60°	—	—	—	—	—	—	—	—	—	19	6	11	27	7	23	27	11	8	21	0	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	38	32	39	34	14	18	20	22	17	14	43	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	19	13	6	13	21	27	0	28	17	28	29	—	—	—	—
150°	—	—	—	—	—	—	—	—	—	6	6	0	7	28	0	13	0	17	7	0	—	—	—	—
180°	—	—	—	—	—	—	—	—	—	0	6	11	20	0	5	7	11	17	7	0	—	—	—	—
210°	—	—	—	—	—	—	—	—	—	6	0	0	0	7	0	0	6	17	0	0	—	—	—	—
240°	—	—	—	—	—	—	—	—	—	6	19	6	0	0	0	0	0	0	14	0	—	—	—	—
270°	—	—	—	—	—	—	—	—	—	0	6	17	0	7	9	7	11	0	7	14	—	—	—	—
300°	—	—	—	—	—	—	—	—	—	0	6	0	0	0	5	7	6	0	0	0	—	—	—	—
330°	—	—	—	—	—	—	—	—	—	6	6	11	0	0	5	13	0	0	0	0	—	—	—	—
Count	0	3	1	3	3	3	4	0	4	16	16	18	15	14	22	15	18	12	14	7	3	5	1	3

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	—	—	—	—
15	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	—	—	—	—
25	—	—	—	—	—	—	—	—	—	0	0	0	0	0	5	0	0	0	0	0	—	—	—	—
35	—	—	—	—	—	—	—	—	—	6	0	0	7	0	5	0	0	0	7	0	—	—	—	—
45	—	—	—	—	—	—	—	—	—	0	0	11	0	0	9	7	17	9	0	14	—	—	—	—
55	—	—	—	—	—	—	—	—	—	0	13	11	0	14	23	27	6	0	14	0	—	—	—	—
65	—	—	—	—	—	—	—	—	—	13	13	6	7	14	18	20	11	9	0	14	—	—	—	—
75	—	—	—	—	—	—	—	—	—	13	32	17	13	7	0	13	34	0	0	0	—	—	—	—
85	—	—	—	—	—	—	—	—	—	13	13	11	13	14	14	0	0	9	21	14	—	—	—	—
95	—	—	—	—	—	—	—	—	—	13	13	11	13	7	5	0	0	0	14	0	—	—	—	—
110	—	—	—	—	—	—	—	—	—	19	6	11	0	14	9	0	17	55	0	14	—	—	—	—
130	—	—	—	—	—	—	—	—	—	19	6	11	7	7	0	0	0	0	7	0	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
140	—	—	—	—	—	—	—	—	—	6	6	11	40	21	14	27	17	18	36	43	—	—	—	—

* Count indicates number of successful observations.

HALLEY BAY SUMMER 1957/8/9

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	5	7	0	10	0	0	0	0	0	0	0	0	0	4	25	0	0	0	0	0	0	0	0
30°	0	5	7	8	0	0	0	0	0	4	10	6	6	0	17	6	10	0	5	5	0	4	0	0
60°	12	0	0	8	10	11	0	5	13	7	0	0	6	8	13	6	0	13	0	0	0	25	33	17
90°	0	5	0	15	5	11	18	5	9	33	10	35	6	8	8	13	10	19	27	16	44	26	25	17
120°	6	0	0	8	5	32	12	5	17	22	40	18	11	15	17	13	40	19	21	48	44	9	8	0
150°	12	5	14	15	20	16	12	18	9	14	10	12	28	23	4	6	30	25	21	27	0	4	0	17
180°	0	0	7	0	5	5	24	27	9	4	10	6	34	31	17	25	10	13	11	5	0	0	0	0
210°	6	10	0	0	5	0	6	18	21	0	5	6	0	8	4	0	0	6	0	0	0	9	0	17
240°	18	20	7	23	10	5	12	18	0	7	0	12	0	0	4	6	0	0	5	0	13	9	8	0
270°	18	35	27	23	25	11	6	0	13	0	10	0	0	0	0	0	0	6	5	0	0	9	17	17
300°	18	10	14	0	5	11	6	0	4	4	5	0	0	0	8	0	0	0	0	0	0	4	8	8
330°	6	5	14	0	0	0	6	5	4	4	0	6	11	8	4	0	0	0	5	0	0	0	0	8
Count	17	20	14	13	20	19	17	22	23	27	20	17	18	13	24	16	10	16	19	19	16	23	12	12

Velocity v' /ms⁻¹/ Hour U. T.

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	6	5	0	0	10	5	0	0	0	4	0	6	0	8	4	6	0	6	0	0	0	0	0	0
35	6	0	7	8	0	0	0	5	5	7	20	6	17	23	17	13	30	13	11	0	13	9	0	17
45	6	5	7	8	0	0	12	0	14	7	25	30	17	8	8	6	0	6	21	5	0	4	8	17
55	6	5	14	15	20	5	18	18	14	22	5	18	17	31	25	6	30	6	5	21	19	4	0	8
65	6	10	14	8	5	11	6	18	23	14	0	18	22	8	13	13	10	13	5	5	19	26	8	0
75	0	10	14	8	10	16	6	5	5	11	10	6	11	15	21	19	10	32	5	16	0	9	0	8
85	12	20	0	15	15	11	24	5	9	4	10	0	6	8	4	19	10	6	16	5	6	4	8	0
95	0	0	0	8	10	5	5	14	5	14	0	6	6	0	0	6	0	13	11	16	19	9	8	0
110	18	5	14	0	10	21	6	9	5	7	15	6	6	0	0	13	0	0	5	16	6	13	8	17
130	0	5	0	8	0	5	6	14	5	4	5	6	0	0	0	0	0	0	11	11	6	0	8	8
≥																								
140	35	30	28	23	20	21	24	14	18	4	10	0	0	0	8	0	10	6	11	5	13	22	50	25

Region E

HALLEY BAY FALL 1958

NUMBER OF SUCCESSFUL
MEASUREMENTS INSUFFICIENT

HALLEY BAY WINTER 1958

*Direction Φ' /Hour U. T.**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	0	25	0	0	40	0	0	—	—	—	0	—	0	0	20	—	—	—	—	—	—	—	—
30°	17	0	0	0	14	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
60°	17	0	50	0	43	40	20	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
90°	17	0	0	0	14	0	20	0	—	—	—	0	—	20	33	0	—	—	—	—	—	—	—	—
120°	0	0	0	0	0	0	0	0	—	—	—	0	—	40	40	0	—	—	—	—	—	—	—	—
150°	0	0	0	0	0	0	0	0	—	—	—	20	—	0	0	0	—	—	—	—	—	—	—	—
180°	0	33	0	14	14	0	0	0	—	—	—	0	—	0	0	20	—	—	—	—	—	—	—	—
210°	0	33	0	14	0	0	0	0	—	—	—	20	—	0	0	0	—	—	—	—	—	—	—	—
240°	17	0	0	0	0	0	0	30	—	—	—	0	—	0	0	40	—	—	—	—	—	—	—	—
270°	17	33	0	14	0	0	40	33	—	—	—	0	—	40	0	0	—	—	—	—	—	—	—	—
300°	17	0	25	43	0	20	20	0	—	—	—	40	—	0	50	0	—	—	—	—	—	—	—	—
330°	0	0	0	14	14	0	0	33	—	—	—	20	0	0	17	20	—	—	—	—	—	—	—	—
Count	6	3	4	7	7	5	5	3	2	0	1	5	2	5	6	5	2	4	4	4	4	4	3	0

Velocity v' /ms⁻¹/ Hour U. T.

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
15	0	0	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
25	0	0	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
35	0	0	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
45	0	0	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
55	0	33	0	0	0	0	0	0	—	—	—	0	—	0	0	0	—	—	—	—	—	—	—	—
65	0	33	25	0	0	20	0	0	—	—	—	0	—	40	17	40	—	—	—	—	—	—	—	—
75	0	0	0	0	29	0	20	66	—	—	—	20	—	0	0	0	—	—	—	—	—	—	—	—
85	0	0	0	0	0	20	0	0	—	—	—	20	—	0	17	20	—	—	—	—	—	—	—	—
95	0	0	0	0	0	20	0	0	—	—	—	0	—	20	0	0	—	—	—	—	—	—	—	—
110	0	0	25	0	0	0	0	0	—	—	—	20	—	0	0	0	—	—	—	—	—	—	—	—
130	17	0	25	29	14	0	0	0	—	—	—	20	—	0	0	0	—	—	—	—	—	—	—	—
≥																								
140	84	33	25	72	57	40	80	33	—	—	—	20	—	40	67	40	—	—	—	—	—	—	—	—

HALLEY BAY SPRING 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	0	0	0	0	0	0	0	7	0	—	—	—	—	—	—	—	13	0	0	7	6	6	0
30°	8	4	0	0	15	12	8	0	7	14	—	—	—	—	—	—	—	0	0	7	0	6	6	0
60°	0	4	18	15	15	30	0	31	21	0	—	—	—	—	—	—	—	13	0	0	14	11	12	6
90°	0	21	18	15	15	6	62	23	21	29	—	—	—	—	—	—	—	13	33	14	0	6	6	30
120°	8	0	18	15	10	12	0	8	7	29	—	—	—	—	—	—	—	25	0	14	7	28	18	12
150°	15	4	0	15	5	6	8	0	21	14	—	—	—	—	—	—	—	0	11	7	14	6	6	0
180°	0	4	0	0	0	6	0	8	0	0	—	—	—	—	—	—	—	0	11	14	7	14	0	6
210°	15	0	0	0	0	0	8	0	4	0	—	—	—	—	—	—	—	0	11	7	0	0	6	6
240°	8	4	0	32	0	0	0	15	0	14	—	—	—	—	—	—	—	13	22	0	14	11	24	12
270°	46	36	36	15	5	12	15	15	4	0	—	—	—	—	—	—	—	0	0	28	21	11	18	18
300°	0	4	9	0	25	6	0	0	0	0	—	—	—	—	—	—	—	13	11	4	14	0	0	12
330°	0	0	0	0	10	6	0	0	0	0	—	—	—	—	—	—	—	13	0	0	0	0	0	0
Count	13	14	11	13	20	14	13	13	14	4	4	5	5	6	5	4	4	8	9	14	14	18	14	14

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	—	—	—	—	—	—	—	0	0	0	0	0	0	0
25	0	4	0	0	5	0	0	8	0	0	—	—	—	—	—	—	—	0	0	0	0	0	0	0
35	0	0	0	8	0	0	0	0	4	0	—	—	—	—	—	—	—	0	0	0	0	0	12	0
45	0	4	8	23	20	0	23	23	0	0	—	—	—	—	—	—	—	0	0	0	28	0	6	12
55	18	4	8	0	25	13	15	0	14	0	—	—	—	—	—	—	—	13	10	0	0	22	6	18
65	24	0	25	0	0	20	31	0	7	0	—	—	—	—	—	—	—	0	0	21	14	11	24	18
75	9	14	14	23	10	13	8	0	7	0	—	—	—	—	—	—	—	25	20	0	21	6	0	12
85	9	21	25	8	0	4	0	15	0	14	—	—	—	—	—	—	—	13	0	14	4	11	6	6
95	18	4	0	23	5	4	0	8	0	14	—	—	—	—	—	—	—	13	10	14	0	22	12	12
110	0	4	14	8	15	20	8	0	21	29	—	—	—	—	—	—	—	0	30	14	0	0	18	0
130	0	0	0	0	10	0	0	8	7	14	—	—	—	—	—	—	—	0	10	14	7	11	6	24
≥																								
140	18	28	0	8	10	20	15	39	36	29	—	—	—	—	—	—	—	34	20	21	21	14	12	0

HALLEY BAY SUMMER 1957/8/9

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30°	0	0	0	0	13	13	0	17	0	0	0	0	20	0	0	25	0	0	0	0	0	0	0	0
60°	9	11	8	22	13	13	14	0	0	14	0	0	20	0	0	0	0	0	0	0	0	0	25	0
90°	0	22	0	11	0	13	14	0	0	0	0	20	20	13	0	0	0	0	0	11	0	0	0	8
120°	0	0	0	0	13	0	14	0	14	14	100	0	20	25	0	0	0	33	14	20	0	0	0	0
150°	9	0	0	0	0	13	14	17	14	0	0	20	0	25	0	50	25	33	14	10	22	0	13	17
180°	0	0	0	0	13	13	0	0	14	14	0	20	0	0	0	25	0	33	27	30	0	13	0	0
210°	18	0	8	0	0	13	14	17	14	0	0	20	0	13	50	0	25	0	14	0	11	13	0	8
240°	9	0	8	0	13	0	0	17	14	14	0	20	0	13	50	0	25	0	14	0	11	0	13	8
270°	46	22	54	56	25	25	14	33	14	27	0	0	20	13	0	0	0	0	20	33	50	38	50	0
300°	9	22	15	11	0	0	14	0	0	14	0	0	0	0	0	0	25	0	14	10	11	0	13	0
330°	0	22	8	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	10	0	25	0	8	0
Count	11	9	13	9	8	8	7	6	7	7	1	5	5	8	2	4	4	3	7	10	9	8	8	12

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	8	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
35	0	0	0	0	0	0	0	0	0	29	0	0	20	0	0	0	33	0	0	0	0	11	0	0
45	0	11	0	11	13	13	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	8	0
55	9	0	15	0	13	25	14	0	0	0	0	0	0	0	0	25	0	29	0	22	0	0	0	0
65	9	22	15	0	0	38	43	0	14	0	0	0	0	0	50	0	0	14	0	0	13	11	17	0
75	9	0	0	11	13	13	14	0	14	0	0	0	0	0	0	0	33	0	0	0	0	0	0	0
85	9	11	0	11	0	0	14	0	0	29	0	0	0	0	0	25	0	0	10	11	0	11	25	0
95	18	11	15	0	0	0	0	33	0	0	0	40	20	0	0	0	0	0	0	0	0	0	8	0
110	18	11	15	0	25	13	0	0	29	14	0	40	20	13	0	25	25	33	14	10	33	13	22	0
130	0	0	23	22	0	0	0	17	0	0	0	0	0	37	0	0	0	14	10	11	38	22	17	0
≥																								
140	27	33	8	44	25	0	0	50	43	29	100	20	40	50	50	75	25	0	29	70	22	38	11	17

HALLEY BAY FALL 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	9	0	0	—	—
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	0	0	0	—	—
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	14	0	20	0	—	—
120°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	14	—	—
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	0	0	0	—	—
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	9	0	0	—	—
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	0	0	0	0	—	—
240°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	14	9	0	14	—	—
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	46	40	57	—	—
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50	14	18	40	14	—	—
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	9	0	0	—	—
Count	1	1	2	1	1	2	0	1	2	3	3	3	3	2	4	1	4	6	7	11	5	7	3	2

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	14	0	0	14	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	0	9	0	14	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	9	0	0	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	9	20	0	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	14	27	0	0	—	—
110	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33	29	18	20	14	—	—
130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17	14	2	40	14	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33	0	9	20	42	—	—

HALLEY BAY WINTER 1958

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	0	0	0	0	0	0	0	6	0	12	15	4	0	6	4	8	0	4	0	0	0
30°	—	—	—	0	33	11	0	0	14	0	6	0	4	4	0	18	3	4	0	0	0	0	0	9
60°	—	—	—	40	50	22	0	20	0	24	19	6	12	0	4	4	6	10	14	6	4	5	9	0
90°	—	—	—	0	0	0	57	40	43	18	13	9	4	15	3	18	6	10	6	16	9	0	18	0
120°	—	—	—	0	0	0	0	20	0	9	0	19	0	0	4	11	16	5	3	3	9	0	0	9
150°	—	—	—	0	0	0	29	0	0	9	0	6	8	11	10	4	9	2	6	0	4	5	0	0
180°	—	—	—	0	0	0	0	0	0	0	6	19	12	15	10	4	0	5	3	3	09	9	0	0
210°	—	—	—	0	0	0	0	0	0	0	13	6	0	4	4	4	6	0	8	6	13	9	0	14
240°	—	—	—	20	17	22	0	0	14	9	13	13	20	11	14	4	3	12	14	13	14	41	24	43
270°	—	—	—	40	0	44	14	0	14	9	6	6	12	4	14	11	28	22	22	38	22	18	46	26
300°	—	—	—	0	0	0	0	0	0	9	13	13	8	4	10	4	12	14	14	10	4	9	0	0
330°	—	—	—	0	0	0	0	20	14	9	6	13	8	11	10	11	3	4	3	3	4	5	0	0
Count	1	2	2	5	6	9	7	5	7	11	16	16	25	24	29	28	32	42	36	31	23	22	11	12

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	—	—	—	0	0	0	0	0	14	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
35	—	—	—	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	4	0	0	0
45	—	—	—	0	0	11	14	0	0	9	0	6	4	0	0	0	0	12	3	0	4	5	9	0
55	—	—	—	0	0	0	0	40	14	0	0	0	0	0	0	4	0	5	0	10	0	0	18	9
65	—	—	—	0	0	11	14	0	14	9	6	0	12	15	10	14	12	9	6	6	9	5	18	0
75	—	—	—	20	14	11	14	0	14	18	6	19	12	8	3	4	12	2	3	3	0	5	0	14
85	—	—	—	0	0	0	0	0	14	0	6	0	16	4	14	4	12	9	11	6	4	9	0	9
95	—	—	—	0	14	0	0	0	0	0	25	13	16	11	4	4	3	12	11	10	13	5	0	0
110	—	—	—	20	0	0	0	0	14	18	6	19	16	11	14	14	12	18	25	13	13	14	18	9
130	—	—	—	0	0	11	14	20	0	9	6	19	4	19	14	11	9	9	14	10	22	5	9	0
≥	—	—	—	60	42	55	43	40	14	36	44	25	20	34	24	36	39	23	28	42	30	54	24	60

2.6. KERGUELEN SPRING 1959

*Direction Φ' /Hour U. T. + 5 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	—	—	—	—	7	—	13	31	8	—	—	7	—	—	0	—	—	0	—
30°	—	—	—	—	—	—	—	—	—	0	—	27	31	9	—	—	11	—	—	0	—	—	0	—
60°	—	—	—	—	—	—	—	—	—	29	—	3	23	17	—	—	17	—	—	9	—	—	0	—
90°	—	—	—	—	—	—	—	—	—	21	—	1	0	2	—	—	33	—	—	27	—	—	0	—
120°	—	—	—	—	—	—	—	—	—	21	—	0	0	0	—	—	9	—	—	0	—	—	0	—
150°	—	—	—	—	—	—	—	—	—	7	—	1	0	4	—	—	7	—	—	18	—	—	0	—
180°	—	—	—	—	—	—	—	—	—	0	—	3	0	8	—	—	7	—	—	0	—	—	0	—
210°	—	—	—	—	—	—	—	—	—	14	—	4	0	6	—	—	0	—	—	45	—	—	0	—
240°	—	—	—	—	—	—	—	—	—	0	—	8	0	32	—	—	7	—	—	0	—	—	8	—
270°	—	—	—	—	—	—	—	—	—	0	—	14	0	4	—	—	0	—	—	0	—	—	42	—
300°	—	—	—	—	—	—	—	—	—	0	—	13	8	8	—	—	2	—	—	0	—	—	50	—
330°	—	—	—	—	—	—	—	—	—	0	—	13	8	4	—	—	2	—	—	0	—	—	0	—

Velocity v' /ms⁻¹/ Hour U. T. + 5 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	—	—	—	—	0	—	0	0	0	—	—	0	—	—	0	—	—	0	—
15	—	—	—	—	—	—	—	—	—	0	—	0	0	0	—	—	0	—	—	0	—	—	8	—
25	—	—	—	—	—	—	—	—	—	0	—	0	0	0	—	—	0	—	—	0	—	—	0	—
35	—	—	—	—	—	—	—	—	—	0	—	3	0	0	—	—	0	—	—	0	—	—	0	—
45	—	—	—	—	—	—	—	—	—	0	—	1	0	0	—	—	0	—	—	0	—	—	0	—
55	—	—	—	—	—	—	—	—	—	0	—	1	0	4	—	—	0	—	—	0	—	—	0	—
65	—	—	—	—	—	—	—	—	—	0	—	3	0	6	—	—	2	—	—	0	—	—	0	—
75	—	—	—	—	—	—	—	—	—	0	—	1	0	6	—	—	0	—	—	0	—	—	0	—
85	—	—	—	—	—	—	—	—	—	7	—	8	0	7	—	—	0	—	—	0	—	—	0	—
95	—	—	—	—	—	—	—	—	—	7	—	18	0	9	—	—	6	—	—	9	—	—	0	—
105	—	—	—	—	—	—	—	—	—	21	—	14	15	19	—	—	10	—	—	0	—	—	0	—
115	—	—	—	—	—	—	—	—	—	43	—	27	38	26	—	—	33	—	—	45	—	—	25	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	—	—	—	—	21	—	24	46	24	—	—	48	—	—	45	—	—	67	—

KERGUELEN SUMMER 1959

*Direction Φ' /Hour U. T. + 5 h**Region E*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	19	5	4	15	7	13	10	6	9	13	16	3	—	0	2	—	—	—	—	—	—	—	—
30°	0	11	2	27	4	14	25	7	0	32	16	21	8	—	0	4	—	—	—	—	—	—	—	—
60°	0	0	5	0	4	21	28	7	6	11	21	16	33	—	7	19	—	—	—	—	—	—	—	—
90°	0	15	7	2	12	4	9	17	8	4	9	1	3	—	7	27	—	—	—	—	—	—	—	—
120°	0	0	5	2	0	0	0	10	6	0	15	6	0	—	43	30	—	—	—	—	—	—	—	—
150°	0	0	7	11	0	2	0	0	2	2	2	4	0	—	17	5	—	—	—	—	—	—	—	—
180°	0	4	19	9	4	0	0	10	2	4	2	4	0	—	17	0	—	—	—	—	—	—	—	—
210°	26	11	34	18	0	2	0	3	6	9	3	4	0	—	3	0	—	—	—	—	—	—	—	—
240°	58	11	10	7	0	4	9	17	25	11	2	4	2	—	7	0	—	—	—	—	—	—	—	—
270°	11	4	3	15	15	12	13	3	17	4	2	1	5	—	0	0	—	—	—	—	—	—	—	—
300°	0	4	3	2	19	19	0	10	13	6	7	4	25	—	0	0	—	—	—	—	—	—	—	—
330°	5	22	2	4	27	16	3	7	10	9	7	21	21	—	0	4	—	—	—	—	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 5 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0	0	—	—	—	—	—	—	—	—
15	0	0	2	4	0	0	0	0	0	0	1	1	2	—	0	0	—	—	—	—	—	—	—	—
25	0	4	5	0	0	0	0	0	0	0	1	5	2	—	3	0	—	—	—	—	—	—	—	—
35	0	0	2	7	0	0	0	3	2	0	4	5	3	—	0	2	—	—	—	—	—	—	—	—
45	11	7	5	9	0	4	13	0	0	6	5	2	10	—	0	3	—	—	—	—	—	—	—	—
55	11	11	8	13	0	2	13	3	0	8	7	4	3	—	13	5	—	—	—	—	—	—	—	—
65	26	4	5	9	0	12	28	3	15	13	6	9	8	—	7	15	—	—	—	—	—	—	—	—
75	21	4	10	20	29	11	16	7	15	13	4	7	7	—	7	8	—	—	—	—	—	—	—	—
85	5	4	14	13	29	16	6	7	8	13	11	12	12	—	27	15	—	—	—	—	—	—	—	—
95	5	19	19	11	25	11	16	27	10	10	13	9	24	—	7	25	—	—	—	—	—	—	—	—
105	11	7	10	7	4	21	6	7	12	8	12	19	20	—	3	12	—	—	—	—	—	—	—	—
115	5	22	12	7	4	16	3	33	21	21	19	19	8	—	23	7	—	—	—	—	—	—	—	—
≥ 120	5	19	8	0	8	9	0	10	17	9	18	9	0	—	10	7	—	—	—	—	—	—	—	—

KERGUELEN FALL 1959

Direction Φ' /Hour U. T. + 5 h

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	29	6	—	0	—	—	2	3	14	0	0	0	9	6	0	11	12	—	—	—	—
30°	—	—	—	14	13	—	0	—	—	21	14	48	27	22	11	16	18	10	8	23	—	—	—	—
60°	—	—	—	0	6	—	36	—	—	26	48	33	15	0	0	13	18	23	22	5	—	—	—	—
90°	—	—	—	0	0	—	0	—	—	9	14	5	0	0	0	3	15	26	14	7	—	—	—	—
120°	—	—	—	0	0	—	0	—	—	8	7	0	4	0	0	0	21	19	14	7	—	—	—	—
150°	—	—	—	0	0	—	0	—	—	6	3	0	8	0	0	0	14	3	3	7	—	—	—	—
180°	—	—	—	0	0	—	0	—	—	4	0	0	4	0	0	6	4	3	8	7	—	—	—	—
210°	—	—	—	0	0	—	0	—	—	8	0	0	0	0	0	9	1	6	6	2	—	—	—	—
240°	—	—	—	0	0	—	0	—	—	2	3	0	8	22	0	16	0	6	0	0	—	—	—	—
270°	—	—	—	7	19	—	27	—	—	2	0	0	12	33	56	22	3	3	6	5	—	—	—	—
300°	—	—	—	29	25	—	18	—	—	4	3	0	8	11	11	3	0	0	6	5	—	—	—	—
330°	—	—	—	21	31	—	18	—	—	9	3	0	15	11	22	3	0	0	3	21	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T. + 5 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	0	0	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	—	—	—	—
15	—	—	—	0	0	—	0	—	—	0	0	0	0	0	0	0	0	0	0	0	—	—	—	—
25	—	—	—	0	6	—	0	—	—	0	0	5	4	0	0	6	0	0	0	0	—	—	—	—
35	—	—	—	0	0	—	36	—	—	13	21	5	0	11	10	22	0	3	0	14	—	—	—	—
45	—	—	—	0	0	—	9	—	—	10	0	5	0	11	10	3	3	0	6	5	—	—	—	—
55	—	—	—	8	31	—	36	—	—	12	10	24	13	22	40	22	3	0	3	2	—	—	—	—
65	—	—	—	0	25	—	0	—	—	19	17	24	8	11	30	16	6	6	19	14	—	—	—	—
75	—	—	—	38	6	—	0	—	—	13	10	5	13	22	0	6	8	3	6	7	—	—	—	—
85	—	—	—	15	19	—	0	—	—	10	7	0	8	11	10	3	11	0	14	16	—	—	—	—
95	—	—	—	31	6	—	18	—	—	8	14	0	8	0	0	9	13	23	19	11	—	—	—	—
105	—	—	—	8	6	—	0	—	—	2	0	19	17	0	0	3	29	39	6	9	—	—	—	—
115	—	—	—	0	0	—	0	—	—	8	17	10	17	11	0	9	19	23	22	20	—	—	—	—
≥	—	—	—	0	0	—	0	—	—	6	3	5	13	0	0	0	8	3	6	2	—	—	—	—
120	—	—	—	0	0	—	0	—	—	6	3	5	13	0	0	0	8	3	6	2	—	—	—	—

[illegible]

KERGUELEN SUMMER 1959

*Direction Φ' /Hour U. T. + 5 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	6	2	0	3	27	8	15	6	14	8	4	6	4	0	11	7	6	9	9	2	21	2	6	3
30°	6	0	12	17	19	23	29	10	18	9	24	9	5	3	8	16	5	6	10	7	21	5	26	3
60°	13	0	0	10	2	21	21	25	26	15	18	21	10	3	14	16	5	10	9	6	17	16	47	0
90°	0	0	0	10	0	8	3	2	16	4	11	13	11	7	12	11	17	10	12	3	4	3	0	0
120°	0	5	0	17	15	6	0	6	4	19	4	5	11	11	24	7	5	5	6	4	2	5	0	0
150°	0	5	2	10	6	0	0	6	0	8	8	3	7	12	10	13	2	12	6	5	9	2	3	0
180°	19	7	0	10	5	4	9	10	2	4	2	0	8	11	7	11	3	14	15	4	9	11	3	0
210°	6	19	2	10	15	23	9	12	4	4	6	5	14	11	2	7	14	10	13	52	4	18	3	50
240°	6	10	5	0	2	2	0	12	4	4	5	4	16	13	1	3	15	10	11	8	2	11	0	21
270°	25	21	5	7	5	0	3	6	4	1	8	8	4	7	9	2	13	5	4	6	6	9	0	11
300°	6	24	24	0	0	4	9	8	4	8	6	14	9	18	2	3	8	8	2	3	2	8	3	11
330°	13	8	49	3	5	0	3	0	4	16	7	14	0	5	1	2	7	2	3	0	2	8	9	3

Velocity v' /ms⁻¹/ Hour U. T. + 5 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	2	0	0
25	0	0	0	0	2	0	0	4	0	0	0	1	3	1	1	0	3	1	2	3	4	3	0	0
35	0	0	0	0	3	0	0	10	7	6	0	4	5	1	1	4	9	1	7	4	13	5	9	8
45	20	0	0	7	6	2	0	8	14	4	4	1	4	2	3	2	8	3	6	7	13	6	15	8
55	27	0	0	0	10	6	3	4	16	4	8	3	10	6	3	8	11	9	8	14	6	9	12	16
65	20	0	0	10	8	4	0	12	7	10	6	5	7	11	4	10	5	6	11	16	6	20	6	8
75	7	0	2	17	11	2	6	2	14	10	11	12	8	10	12	10	7	8	7	9	13	14	9	11
85	0	0	0	24	3	14	9	2	11	15	12	8	10	11	18	14	13	15	8	8	10	11	6	5
95	7	7	7	14	11	20	19	10	0	14	16	13	12	16	17	14	9	16	11	5	15	15	12	13
105	7	7	22	21	3	14	16	10	7	20	13	14	12	9	8	16	9	12	11	6	8	7	3	8
115	7	52	56	7	27	20	28	16	7	14	18	21	17	17	20	14	15	19	16	14	10	7	15	8
≥																								
120	7	33	12	0	15	16	19	22	18	5	12	19	14	15	11	8	10	12	14	13	2	1	15	3

KERGUELEN FALL 1959

*Direction Φ' /Hour U. T. + 5 h**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	0	—	—	—	—	—	—	—	—	0	2	0	—	—	74	5	0	3	19	8	0	2	56	0
30°	64	—	—	—	—	—	—	—	—	10	13	23	—	—	26	8	10	32	9	20	27	26	19	25
60°	21	—	—	—	—	—	—	—	—	57	40	50	—	—	0	47	40	23	34	16	64	17	0	33
90°	7	—	—	—	—	—	—	—	—	33	2	8	—	—	0	21	25	3	9	28	9	15	0	0
120°	0	—	—	—	—	—	—	—	—	0	4	8	—	—	0	16	15	6	9	0	0	4	0	0
150°	0	—	—	—	—	—	—	—	—	0	0	0	—	—	0	3	10	0	16	16	0	6	0	0
180°	0	—	—	—	—	—	—	—	—	0	0	4	—	—	0	0	0	0	3	8	0	6	0	0
210°	0	—	—	—	—	—	—	—	—	0	15	0	—	—	0	0	0	0	0	0	0	6	0	0
240°	0	—	—	—	—	—	—	—	—	0	11	0	—	—	0	0	0	10	0	0	0	2	0	0
270°	0	—	—	—	—	—	—	—	—	0	6	4	—	—	0	0	0	6	0	0	0	4	0	17
300°	0	—	—	—	—	—	—	—	—	0	6	4	—	—	0	0	0	10	0	0	0	6	0	8
330°	7	—	—	—	—	—	—	—	—	0	0	0	—	—	0	0	0	6	0	4	0	4	25	17

Velocity v' /ms⁻¹/ Hour U. T. + 5 h

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	0	—	—	—	—	—	—	—	—	0	0	0	—	—	0	0	0	0	0	0	0	0	0	0
15	0	—	—	—	—	—	—	—	—	0	0	0	—	—	0	0	0	0	0	0	0	0	0	0
25	7	—	—	—	—	—	—	—	—	0	4	0	—	—	0	0	0	0	3	0	18	2	0	0
35	36	—	—	—	—	—	—	—	—	0	8	0	—	—	0	3	0	0	9	0	9	7	50	17
45	36	—	—	—	—	—	—	—	—	10	2	0	—	—	0	5	0	0	6	4	18	10	44	0
55	7	—	—	—	—	—	—	—	—	14	13	4	—	—	0	5	15	0	3	4	18	17	0	0
65	0	—	—	—	—	—	—	—	—	29	17	12	—	—	14	11	0	16	16	8	9	17	6	8
75	0	—	—	—	—	—	—	—	—	29	8	8	—	—	5	11	0	23	3	16	0	7	0	8
85	14	—	—	—	—	—	—	—	—	19	10	15	—	—	24	18	20	19	6	8	9	17	0	8
95	0	—	—	—	—	—	—	—	—	0	4	31	—	—	24	3	5	32	9	12	0	12	0	0
105	0	—	—	—	—	—	—	—	—	0	15	8	—	—	19	5	25	3	13	4	9	0	0	0
115	0	—	—	—	—	—	—	—	—	0	15	23	—	—	14	24	30	3	25	28	9	10	0	42
≥ 120	0	—	—	—	—	—	—	—	—	0	4	0	—	—	0	16	5	3	6	16	0	2	0	17

2.7. OTTAWA AUG.-SEPT. 1957

Direction Φ' *Region E*

% Probability	Day	Night
Direction (°)		
0	6	
30	28	
60	15	
90	8	
120	7	
150	4	
180	1	
210	5	
240	2	
270	6	
300	9	
330	9	

Total count 129

2.7. OTTAWA AUG.-SEPT. 1957

Velocity v' *Region E*

[%] Probability	Day	Night
Velocity m/s		
5	—	
15	—	
25	5	
35	5	
45	9	
55	6	
65	10	
75	21	
85	7	
95	13	
110	6	
140	8	
185	4	
≥200	6	

Total count

140

2.8. TAMANRASSET SPRING 1959

Direction Φ' /Hour U. T.

Region E

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	0	0	0	0	1	5	0	4	14	11	4	3	15	—	0	—	—	—	—
30°	—	—	—	—	—	0	18	6	3	6	4	0	7	8	8	4	44	16	—	0	—	—	—	—
60°	—	—	—	—	—	0	27	0	0	4	15	17	9	3	2	0	18	10	—	50	—	—	—	—
90°	—	—	—	—	—	0	36	0	30	37	38	23	59	1	1	0	3	3	—	20	—	—	—	—
120°	—	—	—	—	—	18	9	6	19	33	20	21	2	5	5	0	0	5	—	10	—	—	—	—
150°	—	—	—	—	—	27	0	6	5	1	5	21	17	3	7	0	0	2	—	10	—	—	—	—
180°	—	—	—	—	—	27	0	6	11	1	2	6	0	7	6	4	0	16	—	10	—	—	—	—
210°	—	—	—	—	—	18	9	6	16	4	5	4	0	16	13	44	6	3	—	0	—	—	—	—
240°	—	—	—	—	—	9	0	25	11	3	2	4	0	22	15	36	6	6	—	0	—	—	—	—
270°	—	—	—	—	—	0	0	31	3	4	2	2	0	11	10	4	12	12	—	0	—	—	—	—
300°	—	—	—	—	—	0	0	13	3	3	2	0	0	4	11	4	3	1	—	0	—	—	—	—
330°	—	—	—	—	—	0	0	0	0	1	0	0	2	6	11	0	6	9	—	0	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	0	0	0	0	0	0	0	0	0	0	0	0	0	—	0	—	—	—	—
15	—	—	—	—	—	0	0	0	0	0	0	0	0	1	0	0	0	0	—	0	—	—	—	—
25	—	—	—	—	—	8	0	0	5	4	4	2	4	7	3	4	3	1	—	0	—	—	—	—
35	—	—	—	—	—	0	0	0	3	4	17	11	4	16	3	0	9	6	—	0	—	—	—	—
45	—	—	—	—	—	8	0	6	11	7	11	11	11	18	17	13	9	8	—	0	—	—	—	—
55	—	—	—	—	—	17	0	6	0	7	20	11	17	14	13	4	17	6	—	0	—	—	—	—
65	—	—	—	—	—	0	0	0	5	21	13	6	17	9	17	13	14	8	—	0	—	—	—	—
75	—	—	—	—	—	0	0	13	5	19	13	6	15	8	7	8	9	11	—	0	—	—	—	—
85	—	—	—	—	—	17	0	13	11	14	1	13	6	7	8	4	14	11	—	9	—	—	—	—
95	—	—	—	—	—	25	9	13	16	7	6	2	4	6	10	4	6	13	—	20	—	—	—	—
105	—	—	—	—	—	17	27	13	27	6	10	9	9	8	7	25	11	15	—	30	—	—	—	—
115	—	—	—	—	—	8	27	25	5	3	1	15	11	2	8	8	0	13	—	10	—	—	—	—
≥	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120	—	—	—	—	—	0	36	13	11	7	4	15	2	4	8	17	9	8	—	40	—	—	—	—

TAMANRASSET SPRING 1959

*Direction Φ' /Hour U. T.**Region F*

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
0°	—	—	—	—	—	0	0	3	0	—	—	—	—	—	—	—	—	0	0	5	—	—	—	—
30°	—	—	—	—	—	3	0	28	4	—	—	—	—	—	—	—	—	4	0	22	—	—	—	—
60°	—	—	—	—	—	10	12	31	0	—	—	—	—	—	—	—	—	0	0	12	—	—	—	—
90°	—	—	—	—	—	48	42	14	9	—	—	—	—	—	—	—	—	11	0	5	—	—	—	—
120°	—	—	—	—	—	6	8	3	17	—	—	—	—	—	—	—	—	15	0	5	—	—	—	—
150°	—	—	—	—	—	3	0	17	0	—	—	—	—	—	—	—	—	4	0	7	—	—	—	—
180°	—	—	—	—	—	0	19	3	9	—	—	—	—	—	—	—	—	22	0	2	—	—	—	—
210°	—	—	—	—	—	10	15	3	13	—	—	—	—	—	—	—	—	4	6	10	—	—	—	—
240°	—	—	—	—	—	0	0	0	30	—	—	—	—	—	—	—	—	22	69	7	—	—	—	—
270°	—	—	—	—	—	0	4	0	13	—	—	—	—	—	—	—	—	19	19	2	—	—	—	—
300°	—	—	—	—	—	13	—	0	4	—	—	—	—	—	—	—	—	0	6	2	—	—	—	—
330°	—	—	—	—	—	6	0	0	0	—	—	—	—	—	—	—	—	0	0	20	—	—	—	—

Velocity v' /ms⁻¹/ Hour U. T.

%	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5	—	—	—	—	—	0	0	0	0	—	—	—	—	—	—	—	—	0	0	0	—	—	—	—
15	—	—	—	—	—	0	0	0	4	—	—	—	—	—	—	—	—	0	0	0	—	—	—	—
25	—	—	—	—	—	3	4	8	13	—	—	—	—	—	—	—	—	19	0	0	—	—	—	—
35	—	—	—	—	—	3	4	11	9	—	—	—	—	—	—	—	—	7	6	0	—	—	—	—
45	—	—	—	—	—	6	4	8	22	—	—	—	—	—	—	—	—	4	31	0	—	—	—	—
55	—	—	—	—	—	23	0	14	9	—	—	—	—	—	—	—	—	19	6	5	—	—	—	—
65	—	—	—	—	—	19	8	16	0	—	—	—	—	—	—	—	—	30	38	15	—	—	—	—
75	—	—	—	—	—	3	4	14	0	—	—	—	—	—	—	—	—	4	13	3	—	—	—	—
85	—	—	—	—	—	3	8	3	13	—	—	—	—	—	—	—	—	19	0	5	—	—	—	—
95	—	—	—	—	—	13	12	3	0	—	—	—	—	—	—	—	—	0	0	10	—	—	—	—
105	—	—	—	—	—	3	4	11	9	—	—	—	—	—	—	—	—	0	6	13	—	—	—	—
115	—	—	—	—	—	10	23	11	13	—	—	—	—	—	—	—	—	0	0	13	—	—	—	—
≥ 120	—	—	—	—	—	13	31	3	9	—	—	—	—	—	—	—	—	0	0	38	—	—	—	—

2.9. YAMAGAWA 1957*

Region E

% Probability	Day	Night
Direction (°)		
0	7	3
30	K 1.5	5
60	3.5	7.5
90	13	9.5
120	4	9.5
150	6.5	12
180	9.5	21
210	11	11.5
240	18	7.5
270	13	5.5
300	5.5	0.5
330	7.5	5
Total Count	199	146

% Probability	Day	Night
5	0	0.5
15	1	0
25	1.5	0.5
35	3.5	2.5
45	8	K 6
55	9.5	5.5
65	11.5	6
75	7.5	9.5
85	8	13
95	8	6
110	14.5	15
140	7.5	9.5
≥140	19	24.5
Count	199	146

1957 *Region F*

% Probability	Day	Night
Direction (°)		
0	16	9
30	5.5	7.5
60	3	7.5
90	10	13
120	5	7
150	5	6
180	15.5	15.5
210	7	8.5
240	14.5	9.5
270	12	8.5
300	4.5	2
330	5	3
Total Count	210	187

% Probability	Day	Night
Velocity m/s		
5	U0.5	0
15	U1	0
25	U0.5	0.5
35	2.5	3
45	4.5	2.5
55	6.5	7
65	6	9
75	6	10.5
85	9.5	5.5
95	7.5	8.5
110	19	17
140	8.5	5
≥140	27	31
Total Count	210	187

* U=uncertain; K=storm conditions.

YAMAGAWA 1958

Region E

% Probability	Day	Night
Direction (°)		
0	1.5	1.0
30	7	3.5
60	7	7.5
90	21.5	13.5
120	18	24
150	10	21.5
180	5	10
210	9	9.5
240	6.5	2.5
270	4	0
300	5	2
330	5	2
Total Count	458	210

% Probability	Day	Night
Velocity m/s		
5	0	0
15	U0.5	0.5
25	2.5	1.5
35	7.5	4
45	12	11.5
55	14	9
65	18.5	16.5
75	12	15
85	10.5	13
95	8	11
110	7	13.5
140	2	2
≥140	6.5	3.5
Total Count	458	210

1958 *Region F*

% Probability	Day	Night
Direction (°)		
0	1.5	0
30	5	2.5
60	11.5	19.5
90	6.5	15
120	16.5	18
150	15	12
180	6	5.5
210	16	12.5
240	15	11
270	1.5	1.5
300	2	1.5
330	1.5	U1.5
Total Count	180	306

% Probability	Day	Night
Velocity m/s		
5	0	0
15	0.5	0.
25	U0.5	U1
35	0	3.5
45	2	5
55	11	12.5
65	18.5	16
75	15	21
85	20	14.5
95	14.5	11
110	6.5	7
140	3	2.5
≥140	8	4.5
Total Count	180	306

YAMAGAWA 1959

Region E

% Probability	Day	Night
Direction (°)		
0	1.0	0.5
30	7.5	3
60	13	10
90	10	1.5
120	19.5	38.5
150	6.5	23.5
180	1	2
210	13	13
240	13.5	3.5
270	1	0
300	8	1.5
330	6.5	2
Total Count	322	140

% Probability	Day	Night
Velocity m/s		
5	0	0
15	0	0
25	U0.5	U0.5
35	3.5	U1.5
45	9.5	9.5
55	14.5	15
65	21	33
75	22	20
85	14.5	9.5
95	8	4.5
110	7	6.5
140	0	0.5
≥140	0	0
Total Count	322	140

1959 *Region F*

% Probability	Day	Night
Direction (°)		
0	1.5	0
30	5.5	1
60	8.5	16
90	2	2.5
120	16	33
150	14.5	16.5
180	2	2
210	27	15.5
240	21	12
270	0	1.5
300	1.5	2
300	0.5	0.5
Total Count	144	218

% Probability	Day	Night
Velocity m/s		
5	0	0
15	0	0
25	0	0
35	2.5	3
45	2	9
55	14.5	15
65	26.5	21.5
75	27	28.5
85	11	15.5
95	10.5	5.0
110	7	2.5
140	0	0
≥140	0	0
Total Count	144	218

III. STATISTICAL TABLES: CORRELATION METHOD

Ionospheric Drifts observed in Mayaguez, Puerto Rico during the IGY Period W. Pfister*

1. The method adopted for the reduction of fading records is based on auto—and cross—correlation curves of records taken for a period of about 3 minutes. It is assumed that the contours of constant correlation are similar concentric ellipsoids of the same orientation in the x, y, vt coordinate system. This implies that the time lags of the auto- and cross-correlation form a straight line in the particular coordinate system used by *Briggs, Phillips and Shinn*.¹

Since the actual data deviate more or less from this assumption a family of correlation ellipsoids with best overall fit has been computed. The exact method will be described in a forthcoming publication by *Keneshea, Gardner and Pfister* [see Part I.3 (d) (viii)].

From the coefficients of the ellipsoid equation the following parameters can be derived according to standard methods².

- v is the drift velocity of the diffraction pattern on the ground in m/sec.
- Φ is the direction of the drift measured in degrees East of North
- v' is the fading velocity in m/sec. and equals V_L in Yerg's notation
- φ is the direction of the major axis of the correlation ellipse measured in degrees West of North
- b is the semi minor axis of the correlation ellipse measured in m and defined for $\rho = 0,5$
- v_c is the characteristic velocity in m/sec. and equals V_i in Yerg's notation
- a/b is the ratio of the major to minor axis of the correlation ellipse

2. Monthly Summary Results

In the following tables not the percentage but the number of observations is listed for each individual category. All observations are concerned with echoes from the E-region; the frequency was 2.9 MHz from February 1958 through March 1959, and 2.33 MHz from April through December 1959. The range indication normally is the central value, except for a/b where the upper range limit has been indicated.

Time is 60° W meridian time (U. T.-4h).

* AFCL, Bedford (Mass.) U. S. A.

¹ *Proc. Phys. Soc. (London) B* 63, 1950, p. 106.

² D. G. Yerg: "Notes on correlation methods for evaluating ionospheric winds from radio fading records." *J. Geophys. Res.* 60, 1955, p. 173.

v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
45	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	1	—	—	—	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
65	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
265	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	—	—	—	—	—	3	—	3	—	3	—	2	—	5	—	—	—	—	—	—	—	—	16

 Φ [illegible]

$$b/m$$

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	—	—	—	—	—	—	—	—	3	—	1	—	2	—	1	—	—	—	—	—	—	—	—	7
375	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
625	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	3	—	—	—	—	—	—	—	—	4
Total	—	—	—	—	—	—	—	—	1	—	3	—	3	—	2	—	4	—	—	—	—	—	—	—	—	13

 v_c/ms^{-1}

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
0—10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
10—20	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
20—30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30—40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40—50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
50—60	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
60—70	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
70—80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
80—90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
90—100	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
100—110	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
110—120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120—130	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2
130—140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
140—150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
150—160	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
160—170	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
170—180	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
180—190	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
190—200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
200—220	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
240—250	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	—	—	—	—	—	3	—	3	—	3	—	2	—	5	—	—	—	—	—	—	—	—	—	16

MARCH 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
15	—	—	1	—	—	1	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	—	—	6
25	1	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
35	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	5
45	—	—	—	1	—	—	—	1	2	—	—	1	1	—	—	—	2	—	1	—	—	—	—	—	—	9
55	—	1	—	—	—	—	1	—	—	—	1	—	1	—	2	—	1	—	—	—	—	—	1	—	—	8
65	—	—	—	—	—	1	—	—	1	—	1	—	1	—	—	—	3	—	—	—	—	—	—	—	—	7
75	—	—	—	—	—	—	—	—	—	—	1	—	2	—	2	—	2	—	—	—	—	—	—	—	—	7
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	3
95	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	4
105	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	4
115	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	4
125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
295	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
315	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
515	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	2	1	1	1	1	2	1	2	10	1	12	1	11	—	11	—	14	1	3	—	—	—	1	—	—	76

ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
0°	—	—	—	—	—	—	—	—	1	—	—	—	1	—	2	—	—	—	1	—	—	—	—	—	—	—	5
30°	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
60°	—	—	—	1	—	—	—	1	—	—	1	—	1	—	—	—	2	—	—	—	—	—	—	—	—	—	6
90°	—	—	1	—	—	—	—	—	1	—	1	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—	6
120°	—	—	—	—	—	—	—	—	2	—	3	—	1	—	—	—	2	—	—	—	—	—	—	—	—	—	8
150°	—	—	—	—	—	—	—	1	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
180°	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	4
210°	—	—	—	—	—	—	—	—	—	1	2	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	5
240°	—	1	—	—	—	1	1	—	1	1	2	—	1	—	3	—	4	1	1	—	—	—	—	—	—	—	17
270°	—	—	—	—	1	—	—	—	3	—	2	—	2	—	1	—	1	—	—	—	—	—	1	—	—	—	11
300°	1	—	—	—	—	—	—	—	—	—	—	—	2	—	4	—	1	—	1	—	—	—	—	—	—	—	9
Total	1	1	1	1	1	2	1	2	11	2	12	1	11	—	11	—	14	1	3	—	—	—	1	—	—	—	77

MARCH 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
15	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	5
25	1	1	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	1	—	—	6
35	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
55	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
65	—	1	—	—	—	—	1	1	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	7
75	—	—	—	1	1	—	—	—	—	—	—	1	—	—	2	—	1	—	1	—	—	—	—	—	—	7
85	—	—	—	—	—	—	—	—	1	—	—	—	3	—	—	—	1	—	—	—	—	—	—	—	—	5
95	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
105	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	3	—	1	—	—	—	2	—	3	—	—	—	—	—	—	—	—	9
125	—	—	—	—	—	—	—	—	—	—	2	—	3	—	—	—	—	—	—	—	—	—	—	—	—	5
135	—	—	—	—	—	—	—	—	1	1	2	—	1	—	1	—	—	—	1	—	—	—	—	—	—	7
145	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
205	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
215	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
245	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
325	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	2
395	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	2	1	1	2	2	2	2	11	2	12	1	11	—	10	—	14	—	4	1	2	2	1	—	—	84

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	2
30	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	1	—	—	—	—	—	—	—	—	5
60	—	—	—	—	—	—	—	—	1	1	4	1	3	—	1	—	1	—	1	—	—	—	—	—	—	13
90	—	1	—	—	—	—	—	—	4	—	1	—	3	—	3	—	3	—	—	—	—	—	1	—	—	17
120	1	—	1	1	1	2	1	1	3	—	2	—	1	—	1	—	7	—	1	—	—	—	—	—	—	23
150	—	—	—	—	—	—	—	1	1	—	2	—	2	—	3	—	2	1	—	—	—	—	—	—	—	12
180	—	—	—	—	—	—	—	—	1	—	2	—	1	—	—	—	—	—	1	—	—	—	—	—	—	5
Total	1	1	1	1	1	2	1	2	11	2	12	1	11	—	11	—	14	1	3	—	—	—	1	—	—	77

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	1	1	1	—	2	3	1	6	2	7	—	7	—	7	—	2	—	2	—	—	1	—	—	—	43
375	1	—	—	—	—	—	—	1	3	—	2	1	3	—	3	—	5	1	1	—	—	—	—	—	—	21
625	—	—	—	—	1	—	—	—	1	—	4	—	1	—	—	—	3	—	1	—	—	—	—	—	—	11
875	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
1125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
1375	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	1	2	1	2	3	3	10	2	14	1	11	—	11	—	12	1	4	—	—	1	—	—	—	81

MARCH 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	1	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	1	1	—	—	9
15	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	1	—	—	—	—	2	—	—	—	—	—	3	—	—	—	1	—	—	—	—	—	—	—	—	7
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	1	1	—	—	2	—	1	—	1	—	3	—	—	—	—	—	—	—	—	9
55	—	—	—	—	—	—	—	1	2	—	1	1	1	—	2	—	—	—	—	—	—	—	—	—	—	8
65	—	—	—	1	—	—	—	—	—	—	1	—	2	—	—	—	2	—	1	—	—	—	—	—	—	7
75	—	—	—	—	—	1	—	—	1	1	—	—	2	—	1	—	2	—	—	—	—	—	—	—	—	8
85	—	—	—	—	—	—	—	—	—	2	2	—	—	—	2	—	1	—	—	—	—	—	—	—	—	7
95	—	—	—	—	—	—	—	—	3	—	1	—	1	—	1	—	1	—	—	—	—	—	—	—	—	7
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	—	—	3	—	1	—	1	—	1	—	—	—	—	—	—	—	—	6
125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	2
265	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
435	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	1	2	1	1	1	2	3	2	9	3	13	1	12	—	11	—	15	—	2	1	2	1	1	—	—	84

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1—1.25	—	—	—	—	—	—	—	—	—	1	1	—	—	—	3	—	—	—	—	—	—	—	—	—	—	5
1.25—1.5	—	—	—	—	—	—	—	—	3	1	6	—	5	—	4	—	4	—	—	—	—	—	—	—	—	23
1.5—1.75	—	—	—	—	—	—	—	—	—	—	3	1	1	—	—	—	2	—	1	—	—	—	—	—	—	8
1.75—2.0	—	—	—	—	—	—	—	1	6	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	10
2.0—2.25	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	4
2.25—2.5	—	—	—	—	—	—	—	—	1	—	1	—	1	—	2	—	1	—	—	—	—	—	—	—	—	6
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	2
3.0—3.25	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
over 4.0	1	—	1	—	1	—	—	—	1	—	1	—	—	—	1	—	3	—	—	—	—	—	—	—	—	9
Total	1	—	1	—	1	1	1	2	11	2	12	1	11	—	11	—	14	—	3	—	—	—	—	—	—	72

APRIL 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
15	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	1	1	—	—	—	—	—	—	5
25	—	—	—	1	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
35	—	—	—	—	—	1	1	—	—	—	4	—	—	—	—	—	1	—	1	1	1	—	—	—	—	10
45	—	—	—	—	—	—	—	—	—	—	1	—	—	—	4	—	2	—	1	—	—	—	1	—	—	9
55	1	—	—	1	1	—	—	—	2	—	—	—	1	—	—	—	1	—	—	—	—	2	—	1	—	10
65	—	—	1	—	—	—	—	—	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4
75	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	2	—	—	—	—	—	—	—	—	4
85	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
125	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	—	—	4
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
265	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
295	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
345	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	3	1	2	2	1	1	1	—	7	2	11	—	4	—	7	2	11	1	3	1	3	2	1	1	—	67

Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3
30°	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	—	—	4
60°	—	—	—	—	—	—	—	—	—	—	2	—	1	—	1	1	2	—	—	—	—	—	—	—	—	7
90°	—	1	—	—	—	—	—	—	—	1	3	—	1	—	1	—	3	1	—	—	—	—	—	—	—	11
120°	—	—	—	—	—	—	1	—	2	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	6
150°	—	—	—	—	—	1	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	5
180°	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1	1	—	—	—	5
210°	1	—	—	1	—	—	—	—	1	1	3	—	—	—	1	—	—	—	1	1	—	—	1	—	—	11
240°	—	—	—	1	1	—	—	—	—	—	2	—	1	—	—	—	—	—	1	—	—	1	—	—	—	7
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
300°	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	3	—	1	—	—	—	—	—	—	7
330°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	2	2	2	1	1	1	—	7	2	12	—	4	—	7	2	11	1	3	1	3	2	1	1	—	68

APRIL 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	1	—	—	5
35	1	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	1	—	—	—	3	—	—	—	—	8
45	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
55	—	1	1	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	1	1	—	—	7
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	2	—	1	—	—	1	—	—	—	7
75	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	2	—	1	—	—	—	—	—	—	6
85	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	4
105	—	—	—	—	—	—	—	—	2	—	—	—	1	—	1	—	3	—	—	—	—	—	—	—	—	7
115	—	—	—	1	—	—	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	4
125	—	—	—	—	1	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
305	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
315	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
475	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	1	2	2	1	1	1	—	8	2	12	—	4	—	5	2	11	1	3	2	4	2	2	1	—	69

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	1	—	—	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	4
30°	—	—	—	—	—	1	—	—	—	—	1	—	—	—	1	—	2	—	—	—	1	1	—	1	—	8
60°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	3
90°	—	—	—	1	—	—	—	—	2	—	3	—	1	—	—	1	2	—	—	1	—	1	1	—	—	13
120°	—	—	—	—	—	—	—	—	2	2	6	—	3	—	3	—	4	1	2	—	—	—	—	—	—	23
150°	1	1	1	—	1	—	1	—	2	—	1	—	—	—	2	1	2	—	1	—	1	—	—	—	—	15
180°	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	2	2	2	2	1	1	1	—	7	2	12	—	4	—	7	2	11	1	3	1	3	2	1	1	—	68

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	2	1	—	2	—	1	1	—	4	1	7	—	1	—	4	1	1	—	1	2	2	—	1	—	—	32
375	—	—	1	—	1	—	—	—	1	—	4	—	1	—	—	—	6	—	1	—	—	1	—	1	—	17
625	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	2	—	—	—	—	—	—	—	—	5
1375	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
1625	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	2	1	1	2	1	1	1	—	6	1	12	—	3	—	4	1	11	—	2	2	2	1	1	1	—	56

APRIL 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
15	—	—	—	—	—	—	—	—	1	—	2	—	—	—	1	—	—	1	—	—	2	—	1	—	—	3
25	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2	—	2	1	—	—	6
35	—	—	—	—	—	—	1	—	—	—	2	—	1	—	—	—	2	—	—	—	1	—	—	—	—	7
45	—	—	—	—	—	—	—	—	—	1	—	1	—	1	1	3	—	—	—	—	—	—	—	—	—	7
55	—	1	—	—	—	—	—	—	—	1	1	—	2	—	—	—	2	—	1	—	—	—	—	—	—	8
65	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	1	—	—	—	—	—	—	1	—	4
85	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	3
105	—	—	—	1	1	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
275	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
285	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
385	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
405	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	—	2	1	1	1	—	7	3	11	—	4	—	4	2	9	1	3	2	3	2	2	1	—	61

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
1.0—1.25	—	—	—	—	1	—	1	—	1	—	1	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	8
1.25—1.5	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	1	1	1	1	—	—	—	—	—	1	—	7
1.5—1.75	—	—	—	1	—	—	—	—	2	—	2	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	7
1.75—2.0	—	1	—	—	—	—	—	—	1	1	3	—	—	—	2	—	2	—	—	1	1	—	—	—	—	—	12
2.0—2.25	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	2	—	—	—	—	5
2.25—2.5	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	3
2.5—2.75	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
2.75—3.0	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
3.0—3.25	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.25—3.5	—	—	1	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	4
3.5—3.75	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	2
over 4.0	1	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
Total	2	1	2	2	1	1	1	—	5	2	11	—	4	—	6	1	10	1	3	1	3	2	1	1	—	—	61

MAY 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
15	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	2	—	—	—	—	—	—	4
25	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	4
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2	1	—	—	—	4
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	3
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	1	—	—	—	—	1	—	—	4
75	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
85	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	1	—	—	—	3
105	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	1	—	—	1	—	—	5
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
345	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	—	—	—	—	—	2	2	3	1	2	3	1	2	2	5	2	2	3	2	3	2	1	—	39

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
30°	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	4
60°	—	1	—	—	—	—	—	—	—	1	—	1	1	—	1	—	2	—	—	—	—	—	—	—	—	6
90°	—	—	—	—	—	—	—	—	1	—	—	1	—	—	1	—	2	1	1	—	—	—	2	—	—	9
120°	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	1	—	—	—	1	—	—	—	—	4
180°	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	3
210°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	1	1	—	—	—	1	—	5
240°	—	—	—	—	—	—	—	—	1	1	—	—	—	1	—	—	—	—	—	—	1	1	—	—	—	5
270°	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	3
Total	—	1	—	—	—	—	—	2	2	3	1	2	3	1	2	2	5	2	2	3	2	3	2	1	—	39

MAY 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3
45	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	—	2	—	—	—	—	6
55	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
65	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	1	1	—	—	—	—	—	—	4
75	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	—	1	—	1	—	—	5
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	1	—	—	1	—	—	—	—	—	4
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	1	—	—	4
125	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	—	—	—	—	—	2	3	2	1	2	3	—	3	2	5	2	2	3	2	3	2	1	—	39

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	2
90°	—	1	—	—	—	—	—	—	—	—	1	1	—	—	—	1	1	—	1	—	—	—	—	—	—	6
120°	—	—	—	—	—	—	—	1	2	1	—	1	3	1	2	—	3	1	—	—	1	1	—	—	—	17
150°	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	1	—	2	1	1	2	—	—	10
180°	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	3
Total	—	1	—	—	—	—	—	2	2	3	1	2	3	1	2	2	5	2	2	3	2	3	2	1	—	39

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	1	—	—	—	—	—	1	3	2	1	1	3	1	2	2	1	2	—	2	—	1	—	—	—	23
375	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	2	1	1	—	1	—	—	1	—	9
Total	—	1	—	—	—	—	—	2	3	3	1	2	3	1	2	2	3	3	1	2	1	1	—	1	—	32

MAY 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	2
35	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	2	—	1	—	—	1	2	—	—	8
45	—	1	—	—	—	—	—	—	—	2	1	—	2	1	—	—	1	3	—	—	—	—	—	—	—	11
55	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2	—	—	1	—	1	—	—	—	—	6
65	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	3
75	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	—	3
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
385	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	—	—	—	—	—	3	3	3	1	2	3	1	2	2	5	3	2	3	2	3	2	—	—	41

 a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
1.0—1.25	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	1	1	—	1	1	—	—	—	7
1.25—1.5	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	2
1.5—1.75	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	1	1	2	—	—	—	—	7
1.75—2.0	—	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	1	1	—	—	—	—	—	—	—	—	5
2.0—2.25	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2.25—2.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	2
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2
3.5—3.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	2
over 4.0	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	—	1	—	—	1	—	—	—	—	—	—	5
Total	—	1	—	—	—	—	—	2	2	3	1	2	3	1	2	2	5	2	2	3	2	3	2	1	—	—	39

JUNE 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	2
15	—	—	—	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	3
25	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4
35	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
45	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	1	—	—	5
55	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	3
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	3	—	—	—	—	1	—	—	—	5
75	1	—	—	—	—	—	—	—	—	—	2	—	—	—	2	—	—	—	—	—	—	—	1	1	—	7
85	—	—	—	—	—	—	—	—	—	1	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
95	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	1	1	—	1	—	—	1	—	3	2	4	—	7	1	5	—	9	1	—	2	1	1	2	2	—	44

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
60°	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	3	1	—	—	—	—	—	—	—	7
90°	—	—	—	—	—	—	1	—	1	—	2	—	1	—	1	—	—	—	—	—	—	1	1	—	—	8
120°	—	—	—	—	—	—	—	—	1	—	—	—	3	—	2	—	2	—	—	—	—	—	1	—	—	9
150°	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	5
180°	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
210°	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
240°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	2
270°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	2
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Total	1	1	—	1	—	—	1	—	3	2	4	—	7	1	5	—	9	1	—	2	1	1	2	2	—	44

JUNE 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	1	—	1	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	5
55	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	—	1	—	—	4
65	—	—	—	—	—	—	—	—	1	1	1	—	1	—	—	—	1	—	—	1	—	—	—	—	—	6
75	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	1	—	—	—	—	1	—	—	—	6
85	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	2
105	—	—	—	—	—	—	—	—	—	—	—	—	3	—	1	—	—	—	—	—	—	—	—	1	—	5
115	—	—	—	—	—	—	—	—	1	1	2	—	—	—	1	—	1	—	—	—	—	—	—	—	—	6
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	2
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	—	1	—	—	1	—	3	2	4	—	8	1	5	—	9	1	—	2	1	1	1	2	—	44

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	2
30°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
60°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
90°	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	3	—	—	—	—	—	—	—	—	7
120°	—	—	—	—	—	—	1	—	—	2	2	—	4	1	4	—	5	—	—	2	—	—	1	—	—	22
150°	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	1	—	—	1	—	1	—	—	6
180°	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Total	1	1	—	1	—	—	1	—	3	2	4	—	7	1	5	—	9	1	—	2	1	1	2	1	—	43

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	1	1	—	1	—	—	—	—	1	1	4	—	4	—	2	—	5	1	—	1	1	1	1	—	—	25
375	—	—	—	—	—	—	—	—	—	1	—	—	3	1	2	—	1	—	—	1	—	—	—	1	—	10
625	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—
875	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
3125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	1	1	—	1	—	—	—	—	2	2	4	—	7	1	5	—	8	1	—	2	1	1	1	1	—	39

JUNE 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	3
25	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	—	3	—	—	—	—	—	1	—	—	7
35	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
45	1	—	—	—	—	—	1	—	1	1	2	—	3	—	—	—	1	—	—	—	—	1	—	—	—	11
55	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	4
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	1	—	—	—	—	—	4
75	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	—	—	—	—	1	—	—	1	2	7
85	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	1	—	—	—	—	—	4
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	—	1	—	—	1	—	2	2	4	—	8	1	5	—	10	1	—	2	1	1	2	2	—	45

 a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	1	—	—	—	1	—	4
1.25—1.5	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3
1.5—1.75	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	3	—	—	—	—	—	1	—	—	6
1.75—2.0	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	5
2.0—2.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
2.25—2.5	—	—	—	—	—	—	—	—	1	1	1	—	1	—	3	—	2	—	—	—	—	—	—	—	—	9
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	1	—	—	—	3
3.0—3.25	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	1	—	—	—	—	—	—	—	4
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
over 4.0	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
Total	1	1	—	1	—	—	1	—	3	2	3	—	7	1	5	—	9	1	—	2	1	1	2	2	—	43

JULY 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	1	1	—	—	5
25	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	1	—	—	—	—	—	—	1	—	4
35	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	1	1	—	—	—	—	6
45	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	1	—	—	—	—	5
55	—	—	—	—	—	—	—	—	1	—	3	—	1	—	1	—	1	—	1	—	—	—	—	—	—	8
65	1	—	—	—	1	—	—	—	—	—	2	—	1	—	—	—	3	—	—	—	—	1	—	—	—	9
75	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	2	1	—	1	1	—	—	—	—	7
85	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	1	—	—	—	5
95	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
115	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	3
125	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
215	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	2	1	1	1	1	—	1	1	8	1	10	1	6	1	11	1	8	2	2	3	3	3	2	1	—	64

 ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
30°	—	—	1	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	1	1	—	1	—	—	7
60°	—	—	—	—	—	—	—	—	11	—	1	—	2	—	—	—	2	—	—	—	—	—	—	—	—	9
90°	—	—	—	—	—	—	—	—	—	1	5	—	—	—	3	—	2	2	—	—	1	1	—	—	—	15
120°	1	—	—	—	—	—	—	1	1	—	—	—	1	—	—	—	3	—	1	—	—	—	—	—	—	8
150°	—	1	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	1	—	—	—	—	—	5
180°	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	1	—	—	4
210°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
240°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2
270°	—	—	—	1	—	—	1	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	5
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
330°	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	1	—	1	—	1	—	5
Total	2	1	1	1	1	—	1	1	8	1	10	1	7	—	4	1	8	2	2	3	3	3	2	1	—	64

JULY 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2
35	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	3
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	3
55	—	—	—	1	—	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	1	—	—	—	—	5
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	2	—	1	1	—	—	—	8
75	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
85	1	—	—	—	—	—	—	—	1	—	2	1	2	—	—	—	—	—	—	—	—	—	—	—	—	7
95	—	—	1	—	1	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	1	1	1	—	—	8
105	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	1	—	1	—	1	—	—	—	5
115	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	3
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
215	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
265	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
335	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
485	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	1	1	1	1	—	1	2	8	2	10	1	6	1	4	—	8	2	3	3	3	3	2	1	—	66

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	5
30°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	1	—	—	—	—	4
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
90°	—	—	—	—	—	—	—	—	—	—	5	—	1	1	1	—	2	—	—	—	—	1	1	—	—	12
120°	—	—	—	—	—	—	1	—	5	1	4	1	4	—	2	—	3	2	1	1	1	—	—	1	—	27
150°	—	1	1	1	—	—	—	—	1	—	1	—	—	—	1	—	1	—	—	1	1	1	1	—	—	11
180°	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	5
Total	2	1	1	1	1	—	1	1	8	1	10	1	6	1	4	1	8	2	2	3	3	3	2	1	—	64

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	1	—	1	1	—	1	—	4	—	7	1	4	—	2	—	4	1	2	2	2	1	1	1	—	36
375	1	—	1	—	—	—	—	—	2	—	2	—	2	—	2	—	2	—	1	1	—	1	—	—	—	15
625	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	6
875	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
1125	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	1	1	1	1	1	—	1	1	9	3	9	1	6	—	4	—	8	2	3	3	2	2	1	1	—	61

JULY 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
15	—	1	—	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	4
25	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	8
35	—	—	—	1	—	—	—	—	1	—	—	—	1	—	—	—	3	1	—	—	1	—	—	—	1	—	8
45	—	—	—	—	—	—	—	—	2	—	3	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	8
55	2	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	2	—	—	—	—	3
65	—	—	—	—	—	—	—	1	1	1	2	—	1	—	1	—	—	—	—	—	2	1	—	—	—	—	17
75	—	—	—	—	1	—	—	—	—	—	3	—	—	—	—	—	—	1	—	3	—	1	—	—	—	—	0
85	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	9
95	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	1	—	—	—	5
105	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
325	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
425	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	1	1	1	2	—	1	2	8	1	12	—	6	2	1	—	7	2	4	4	4	4	2	1	—	71	

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	5
1.25—1.5	—	—	—	—	—	—	—	—	1	1	3	—	—	—	1	—	—	—	1	2	2	—	2	—	—	13
1.5—1.75	1	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	—	—	—	—	1	—	—	1	—	7
1.75—2.0	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	1	—	1	—	2	—	—	—	8
2.0—2.25	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
2.25—2.5	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	2	—	—	—	—	1	—	—	—	6
2.5—2.75	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	5
2.75—3.0	—	—	—	—	—	—	—	—	1	—	3	—	1	—	—	—	—	—	—	—	—	—	—	—	—	5
3.0—3.25	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
4.0	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	3
Total	2	1	1	1	1	—	1	1	8	1	10	1	6	—	4	—	1	2	2	3	3	3	2	1	—	6

v/ms^{-1} [illegible]

v'/ms^{-1}

¶

[illegible]

$$b/m$$
[illegible]

SEPTEMBER 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
15	—	—	—	—	—	1	—	—	1	—	1	—	—	—	3	—	1	—	—	—	—	—	—	—	—	7
25	—	—	—	1	1	—	—	—	1	—	—	—	1	—	—	—	4	—	—	—	—	2	—	—	—	10
35	—	2	—	—	—	—	—	—	2	1	3	—	—	—	—	—	4	—	—	—	—	—	1	1	—	14
45	—	—	—	—	—	—	—	—	3	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	5
55	2	—	—	—	—	—	—	—	—	—	1	—	1	—	1	1	2	—	—	1	—	—	—	—	—	9
65	1	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	1	1	—	—	—	—	—	—	6
75	—	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	2	—	—	—	—	—	—	—	—	6
85	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	1	—	—	—	—	4
95	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	3
105	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
115	—	—	—	—	—	—	—	1	—	—	2	—	—	—	—	—	2	1	—	—	—	1	—	—	—	7
125	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
135	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
295	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
415	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Total	3	3	—	1	1	1	—	1	12	2	10	—	8	1	12	1	22	2	1	2	1	3	3	2	—	90

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	1	2	—	—	—	—	—	—	—	—	6
30°	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2	1	—	—	—	2	2	2	—	12
60°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2	1	—	—	—	1	—	—	—	5
90°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	4	—	1	—	—	—	1	—	—	9
120°	2	2	—	—	—	1	—	—	2	—	—	—	1	—	1	—	2	—	—	—	—	—	—	1	—	12
150°	—	—	—	1	—	—	—	—	—	1	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	5
180°	—	1	—	—	—	—	—	—	—	—	2	—	—	—	1	—	2	—	—	—	—	—	—	—	—	6
210°	—	—	—	—	1	—	—	—	—	—	1	—	2	—	1	—	1	—	—	—	—	—	—	1	—	7
240°	—	—	—	—	—	—	—	—	4	1	5	—	1	—	2	—	3	—	—	—	1	—	—	—	—	17
270°	—	—	—	—	—	—	—	—	3	—	—	—	2	—	1	—	3	—	—	—	—	—	—	—	—	9
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	2	—	—	—	—	—	—	—	—	5
330°	—	—	—	—	—	—	—	—	1	—	2	—	2	—	1	—	1	—	—	2	—	—	—	—	—	9
Total	3	3	—	1	1	1	—	1	14	2	14	—	8	1	12	1	24	2	1	2	1	3	3	4	—	102

SEPTEMBER 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
55	—	—	—	—	—	—	—	—	1	2	3	—	—	—	—	—	2	—	—	—	—	—	—	—	—	8
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	—	—	—	—	1	—	—	5
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	2	—	—	—	—	—	—	1	—	7
85	—	1	—	—	—	—	—	—	3	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	9
95	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	4
105	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	4	—	—	1	1	1	—	—	—	10
115	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	3
125	—	1	—	—	—	—	—	1	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	5
135	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	1	1	1	—	—	—	—	—	—	5
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	4
165	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	1	1	—	—	4
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	3
185	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
215	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
225	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
285	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
305	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	2	2	—	—	1	1	—	1	12	2	10	—	7	—	11	1	23	2	1	2	1	2	2	1	—	84

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
30°	2	2	—	1	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	3	2	2	—	15
60°	—	—	—	—	—	—	—	—	1	1	—	—	2	—	1	—	1	—	—	—	—	1	—	—	—	7
90°	—	—	—	—	—	—	—	—	5	—	4	—	—	—	1	—	3	—	1	—	—	—	—	—	—	14
120°	—	—	—	—	—	—	—	—	3	1	8	—	3	—	6	1	14	2	—	—	1	—	—	—	—	39
150°	1	—	—	—	—	—	—	—	4	—	2	—	1	—	1	—	4	—	—	1	—	—	—	2	—	16
180°	—	—	—	—	1	—	—	—	1	—	—	—	2	—	1	—	—	—	—	1	—	—	—	—	—	6
Total	3	3	—	1	1	1	—	1	14	2	14	—	8	1	12	1	23	2	1	2	1	4	2	4	—	101

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	2	2	—	1	2	1	—	1	5	1	6	—	4	—	7	1	6	2	—	—	—	2	1	1	—	45
375	—	—	—	—	—	—	—	—	3	1	1	—	—	—	3	—	8	—	1	2	1	—	1	—	—	21
625	—	—	—	—	—	—	—	—	3	—	1	—	—	—	—	—	4	—	—	—	—	—	—	—	—	8
875	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
1375	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	2	2	—	1	2	1	—	1	12	2	8	—	5	—	10	1	19	2	1	2	1	2	2	1	—	77

SEPTEMBER 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
15	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
35	—	—	—	—	—	—	—	1	—	1	1	—	—	—	1	—	3	—	—	1	—	—	—	—	—	8
45	—	—	—	—	—	—	—	—	1	—	3	—	—	—	2	—	2	—	—	—	—	—	—	—	—	8
55	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	3
65	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	1	5	—	—	—	—	—	—	1	—	11
75	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	2	1	—	—	1	—	—	—	—	6
85	2	3	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	—	—	—	—	2	—	—	10
95	—	—	—	—	—	—	—	—	2	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	5
105	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	2	—	—	—	5
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2	—	1	—	—	1	—	—	—	6
125	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	1	—	—	—	—	—	4
145	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
255	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
358	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	3	—	—	2	1	—	1	10	2	10	—	7	—	11	1	21	3	1	2	1	3	3	1	—	85

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1—1.25	—	—	—	—	—	—	—	—	1	—	2	—	1	—	1	—	4	—	1	—	—	—	—	—	—	10
1.25—1.5	—	—	—	—	—	—	—	1	1	—	1	—	2	—	4	—	4	—	—	—	—	—	—	—	—	13
1.5—1.75	—	—	—	—	—	—	—	—	3	—	—	—	1	—	1	—	1	—	—	—	1	—	—	1	—	8
1.75—2.0	—	3	—	—	—	—	—	—	3	—	1	—	—	—	1	—	3	—	—	1	—	3	—	—	—	15
2.0—2.25	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	—	1	—	—	—	—	—	2	—	—	7
2.25—2.5	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	6
2.5—2.75	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
2.75—3.0	—	—	—	—	1	—	—	—	—	—	2	—	1	—	1	1	1	—	—	—	—	—	1	—	—	8
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
3.25—3.5	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	3
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
over 4.0	1	—	—	—	—	—	—	—	2	1	2	—	1	—	—	—	—	1	—	1	—	—	—	—	—	9
Total	3	3	—	—	1	—	—	1	12	2	10	—	6	—	11	1	20	2	1	2	1	3	3	1	—	83

OCTOBER 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
15	1	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	6
25	—	2	—	—	—	—	1	—	2	—	—	1	1	—	—	—	—	—	—	—	—	—	—	1	—	8
35	—	—	—	—	1	—	—	—	1	1	1	—	—	—	1	—	1	—	1	1	1	—	—	1	—	10
45	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	1	—	—	—	—	—	—	1	—	—	4
55	—	—	—	—	—	—	—	—	1	—	2	—	1	—	—	—	—	1	—	—	—	—	—	—	—	5
65	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	2	—	—	1	—	—	—	—	—	6
75	—	—	—	—	—	—	—	—	1	—	1	—	1	1	1	—	1	—	—	—	—	—	—	—	—	6
85	—	—	—	—	—	—	—	—	—	—	—	1	1	—	3	—	—	—	—	—	—	—	—	—	—	5
95	—	—	—	—	—	—	—	—	—	—	2	—	1	—	3	—	1	—	—	—	—	1	—	—	—	8
105	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	—	—	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	1	—	—	—	—	—	—	—	—	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	1	—	—	4
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
325	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
345	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
415	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	1	2	—	—	1	1	2	1	7	1	12	2	8	2	12	2	14	1	1	2	1	1	2	2	—	18

ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	—	—	3	—	1	—	—	—	—	1	—	—	—	—	—	5
30°	—	—	—	—	—	1	—	—	—	—	2	—	—	—	1	—	2	—	—	—	—	—	—	—	—	6
60°	1	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	2	—	—	—	—	—	—	—	—	7
90°	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	2	3	—	—	—	—	—	—	1	—	9
120°	—	—	—	—	—	—	—	—	1	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	3
150°	—	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	1	—	1	—	—	—	—	6
180°	—	—	—	—	1	—	1	—	—	1	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	5
210°	—	—	—	—	—	—	1	—	2	—	1	1	1	—	—	—	1	—	—	—	—	—	2	—	—	9
240°	1	—	—	—	—	—	—	1	2	—	2	—	1	1	—	—	2	—	—	—	—	—	—	—	—	10
270°	—	—	—	—	—	—	—	—	1	—	3	1	—	—	2	—	1	—	—	1	1	—	1	1	—	12
300°	—	1	—	—	—	—	—	—	1	—	1	—	1	—	2	—	1	1	—	—	—	1	—	—	—	9
330°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	2	—	—	1	1	2	1	8	1	12	2	8	2	12	2	14	1	1	2	2	1	3	2	—	83

OCTOBER 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
35	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2
45	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	3
55	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
65	—	—	—	—	—	—	1	—	—	2	—	1	—	1	—	—	—	1	1	1	—	—	—	—	—	8
75	1	—	—	—	—	1	—	—	1	2	—	1	1	1	—	—	—	1	—	—	—	—	—	—	—	8
85	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	1	—	—	—	—	—	3
95	—	—	—	—	1	—	1	—	—	—	—	—	3	—	1	—	1	—	—	—	—	—	—	—	—	7
105	—	—	—	—	—	—	—	—	1	1	—	—	—	1	2	—	3	—	—	—	—	1	—	—	—	9
115	—	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	1	—	—	—	—	—	—	—	—	4
125	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	2
175	—	—	—	—	—	—	—	—	1	—	2	—	—	—	1	—	2	—	—	—	—	—	—	—	—	6
185	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
205	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
215	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
255	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	2	2	—	—	1	1	2	1	7	1	13	2	8	2	12	2	13	1	1	2	1	1	2	1	—	78

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	4
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	1	2	—	—	—	—	5
60°	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	3	—	—	1	—	1	—	—	—	8
90°	—	—	—	—	—	—	—	—	—	1	3	—	4	—	4	—	3	—	—	—	—	—	—	1	—	16
120°	1	1	—	—	—	1	1	—	2	—	7	—	3	2	5	2	7	1	—	—	—	—	1	—	—	34
150°	—	1	—	—	—	—	—	—	3	—	2	1	—	—	1	—	—	—	1	—	—	—	1	1	—	11
180°	1	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Total	2	2	—	—	1	1	2	1	8	1	13	1	8	2	12	2	14	1	1	2	2	1	3	2	—	82

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	—	—	1	1	—	1	4	1	4	—	2	1	7	—	5	—	—	—	—	—	1	—	—	28
375	1	2	—	—	—	—	1	—	2	—	5	—	3	1	3	—	5	—	1	1	2	1	2	—	—	30
625	—	—	—	—	—	—	—	—	2	—	2	1	1	—	—	—	—	2	1	—	—	—	—	—	—	9
875	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	3
1375	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Total	1	2	—	—	1	1	1	1	8	1	12	1	7	2	10	—	10	2	4	1	2	1	3	—	—	71

OCTOBER 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	3
15	—	2	—	—	—	—	—	1	—	—	1	—	—	1	1	—	—	—	—	—	—	—	2	—	—	8
25	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	2	—	4
35	1	—	—	—	—	—	—	—	—	—	1	—	1	—	2	—	—	—	—	—	—	—	—	—	—	5
45	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	1	—	—	—	1	—	—	—	5
55	—	—	—	—	—	—	—	—	—	—	1	—	2	—	2	—	2	—	1	1	1	—	—	—	—	10
65	—	—	—	—	—	—	1	—	1	—	1	—	—	—	2	—	—	—	—	1	—	—	—	—	—	6
75	—	—	—	—	—	1	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	4
85	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	1	1	—	—	—	—	—	—	—	—	4
95	—	—	—	—	—	—	1	—	—	1	1	—	2	—	—	1	1	—	—	—	—	—	—	—	—	7
105	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2	—	—	—	—	—	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
165	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
215	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
335	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	3	2	—	—	1	1	2	1	7	1	12	2	8	1	11	2	13	1	1	2	1	1	2	3	—	78

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	1	—	1	—	1	—	2	—	1	—	1	—	—	—	—	1	—	—	—	8
1.25—1.5	—	—	—	—	—	1	—	—	1	—	2	1	2	—	1	—	1	—	—	2	—	—	—	—	—	11
1.5—1.75	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	2	—	1	—	—	—	—	—	—	—	6
1.75—2.0	—	—	—	—	—	—	—	—	4	—	1	—	1	—	4	—	3	—	—	—	1	—	—	—	—	14
2.0—2.25	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	—	1	—	—	—	—	—	—	4
2.25—2.5	—	—	—	—	—	—	—	—	—	—	1	—	2	—	1	—	1	—	—	—	—	—	—	—	—	5
2.5—2.75	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	1	—	—	3
2.75—3.0	1	1	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	3
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
over 4.0	1	—	—	—	—	—	1	1	—	—	—	—	1	—	3	—	2	—	—	—	—	—	—	—	—	9
Total	2	1	—	—	1	1	2	1	7	—	10	2	8	2	12	2	13	1	1	2	1	1	1	—	—	71

NOVEMBER 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	1	—	—	—	—	—	—	1	—	5
15	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	1	—	—	—	—	4
25	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	1	—	—	—	—	—	—	1	—	5
35	1	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
45	—	—	—	—	—	—	—	1	—	—	1	1	1	—	1	—	3	—	—	—	1	—	1	—	—	10
55	1	—	—	—	—	—	—	—	1	—	—	—	2	—	1	—	—	—	—	1	—	—	—	—	—	6
65	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	—	4
75	—	—	—	—	—	—	—	—	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
85	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
95	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—	1	—	—	—	—	—	4
115	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
125	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
215	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
265	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
285	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
325	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
385	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Total	2	—	—	—	—	1	1	3	6	3	16	1	8	1	10	—	11	1	—	2	3	—	2	2	—	73

ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	3
30°	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	—	1	—	—	1	1	—	—	—	—	6
60°	—	—	—	—	—	—	—	—	2	—	3	—	—	—	—	—	1	—	—	1	—	—	—	—	—	7
90°	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	3	—	—	—	—	—	1	—	—	7
120°	—	—	—	—	—	—	—	—	—	—	1	—	1	—	3	—	—	—	—	—	—	—	—	—	—	5
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
180°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	3
210°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	2	—	—	—	—	—	—	1	—	6
240°	—	—	—	—	—	1	1	1	—	1	2	—	1	—	1	—	3	—	—	—	1	—	—	—	—	13
270°	1	—	—	—	—	—	—	—	—	—	7	—	—	—	2	—	2	—	—	—	—	—	—	—	—	12
300°	—	—	—	—	—	—	—	1	3	—	—	—	1	—	1	—	—	—	—	—	1	—	—	1	—	8
330°	1	—	—	—	—	—	—	1	—	2	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
Total	2	—	—	—	—	1	1	3	6	3	16	1	8	1	11	—	13	1	—	2	3	—	2	2	—	76

NOVEMBER 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
35	1	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	4
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	1	—	—	3
55	—	—	—	—	—	—	1	—	—	—	—	1	2	—	1	—	1	—	—	1	—	—	—	—	—	7
65	1	—	—	—	—	—	—	3	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	6
75	—	—	—	—	—	—	—	—	—	3	—	—	1	—	—	—	—	—	—	—	1	—	—	1	—	6
85	—	—	—	—	—	—	—	—	1	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	4
95	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	—	1	2	—	—	—	2	—	1	—	—	—	—	—	—	—	—	6
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
135	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2	—	—	—	—	—	—	—	—	—	—	4
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
265	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	3
275	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
285	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
365	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
395	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
405	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
435	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	3	—	—	—	—	1	1	3	5	3	15	1	8	1	11	—	11	—	—	2	2	—	2	2	—	71

φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	1	—	5
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	1	—	—	—	—	4
60°	—	—	—	—	—	—	—	—	1	—	2	—	—	—	3	—	1	—	—	—	—	—	—	—	—	7
90°	—	—	—	—	—	—	—	—	2	1	2	—	2	—	2	—	2	—	—	—	—	—	—	—	—	11
120°	—	—	—	—	—	—	1	2	1	2	9	1	6	1	4	—	8	—	—	—	—	—	—	—	—	35
150°	—	—	—	—	—	—	—	—	2	1	2	1	—	—	—	—	2	1	—	—	—	—	1	—	—	10
180°	1	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	1	—	5
Total	2	—	—	—	—	1	1	3	6	4	15	2	8	1	11	—	13	1	—	2	3	—	2	2	—	77

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	2	—	—	—	—	1	1	—	3	—	7	1	3	1	4	—	4	—	—	—	1	—	—	1	—	29
375	—	—	—	—	—	—	—	—	2	1	3	—	3	—	4	—	5	—	—	1	—	—	2	—	—	21
625	—	—	—	—	—	—	—	—	—	1	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4
875	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	2	—	—	—	—	1	1	1	5	2	13	1	7	1	8	—	9	—	—	1	1	—	2	1	—	56

NOVEMBER 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15	2	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	5
25	—	—	—	—	—	—	—	2	—	2	—	—	1	—	—	—	—	—	—	—	1	—	1	—	—	7
35	—	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	—	—	—	—	—	—	1	—	4
45	—	—	—	—	—	—	1	1	—	—	—	—	2	—	—	—	2	—	—	1	—	—	—	—	—	7
55	—	—	—	—	—	—	—	1	—	—	2	—	1	—	2	—	—	—	—	—	—	—	—	—	—	6
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	3
75	—	—	—	—	—	—	—	—	2	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
85	—	—	—	—	—	—	—	—	1	—	1	—	2	—	1	—	—	—	—	—	—	—	—	—	—	5
95	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	2
115	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
215	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
305	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
375	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
385	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
435	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Total	3	—	—	—	—	1	1	4	5	5	10	1	6	2	8	—	9	1	—	2	2	—	2	2	—	64

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total	
1.0—1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	
1.25—1.5	—	—	—	—	—	—	—	—	—	—	1	—	2	—	1	—	2	—	—	—	—	—	—	—	—	—	6
1.5—1.75	—	—	—	—	—	—	—	1	2	1	1	—	1	—	2	—	—	—	—	—	—	—	1	—	—	9	
1.75—2.0	—	—	—	—	—	—	—	2	2	—	1	—	—	1	2	—	3	—	—	—	1	—	—	1	—	13	
2.0—2.25	—	—	—	—	—	—	—	—	—	—	2	—	1	—	1	—	1	—	—	—	—	—	—	—	—	5	
2.25—2.5	—	—	—	—	—	—	—	—	—	—	4	—	—	—	1	—	1	—	—	—	—	—	—	—	—	6	
2.5—2.75	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	1	—	—	1	—	—	—	—	—	5	
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	1	—	—	4	
3.0—3.25	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3	
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	
3.5—3.75	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2	
3.75—4.0	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3	
over 4.0	—	—	—	—	—	—	1	—	—	3	—	—	2	—	2	—	—	—	—	—	1	—	—	—	—	9	
Total	—	—	—	—	—	1	1	3	5	4	14	1	8	1	10	—	10	—	—	2	3	—	2	2	—	67	

DECEMBER 1958

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	1	—	4
25	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	4
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
45	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	3
55	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	1	—	—	4
65	—	—	—	—	—	—	—	—	1	1	—	—	—	2	2	—	2	—	—	—	—	—	—	—	—	8
75	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—	1	—	—	—	4
85	—	—	—	—	—	—	—	—	2	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	4
95	—	—	—	—	—	—	—	—	—	1	1	1	1	—	—	—	2	—	1	—	—	1	—	—	—	8
105	—	—	—	1	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
215	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
315	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	2	1	1	—	—	—	1	7	2	11	1	5	2	6	1	8	—	2	—	—	2	2	1	—	53

ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	1	—	1	—	—	1	1	—	1	—	—	—	—	—	—	—	—	5
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	2
60°	—	—	1	—	—	—	—	—	1	—	2	—	1	—	—	—	—	—	—	—	—	—	1	—	—	6
90°	—	1	—	—	—	—	—	—	—	—	1	—	1	—	1	1	1	—	—	—	—	—	—	—	—	6
120°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2
150°	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	1	—	—	—	4
180°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
240°	—	—	—	1	—	—	—	—	3	1	1	1	—	—	3	—	1	—	—	—	—	—	—	—	—	11
270°	—	—	—	—	—	—	—	1	1	—	3	—	1	—	—	—	—	—	—	—	—	1	—	—	—	7
300°	—	—	—	—	—	—	—	—	—	1	1	—	—	1	—	—	1	—	1	—	—	—	—	—	—	5
330°	—	—	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
Total	—	2	1	1	—	—	—	1	8	2	12	1	5	2	6	1	6	—	2	—	—	2	2	1	—	55

DECEMBER 1958

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
45	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
55	—	1	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
65	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	3
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	2
85	—	—	—	—	—	—	—	—	—	—	1	—	1	1	—	—	1	—	1	—	—	—	—	—	—	5
95	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	1	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
115	—	—	—	—	—	—	—	—	1	—	2	1	1	1	1	—	1	—	—	—	—	—	—	—	—	8
125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	1	—	—	3
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
145	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
155	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2
165	—	—	—	—	—	—	—	1	1	—	2	—	—	—	1	—	—	—	—	—	—	1	—	—	—	6
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
255	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
485	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	2	1	1	—	—	—	1	8	2	10	1	5	2	6	1	6	—	2	—	—	2	2	1	—	53

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	3
30°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
60°	—	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
90°	—	—	—	—	—	—	—	—	—	—	5	—	1	—	—	1	—	—	—	—	—	—	—	—	—	7
120°	—	—	—	—	—	—	—	—	1	1	2	1	3	1	5	—	6	—	1	—	—	—	1	—	—	22
150°	—	1	—	1	—	—	—	1	3	1	2	—	1	1	1	—	—	—	—	—	—	1	—	1	—	14
180°	—	—	—	—	—	—	—	—	2	—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	5
Total	—	2	1	1	—	—	—	1	8	2	12	1	5	2	6	1	6	—	2	—	—	2	2	1	—	55

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	2	1	1	—	—	—	—	3	1	4	—	5	2	3	1	—	—	—	—	—	2	2	1	—	28
375	—	—	—	—	—	—	—	1	2	1	1	1	—	—	1	—	4	—	1	—	—	—	—	—	—	12
625	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
875	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1625	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	2	1	1	—	—	—	1	7	2	10	1	5	2	5	1	5	—	1	—	—	2	2	1	—	49

DECEMBER 1958

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
25	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	—	—	—	—	1	—	—	4
35	—	1	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	4
45	—	—	—	—	—	—	—	—	1	—	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	4
55	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	3
65	—	—	—	—	—	—	—	1	1	1	2	1	2	—	—	—	—	—	—	—	—	—	—	—	—	8
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	4
105	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	2
115	—	—	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
135	—	—	—	—	—	—	—	—	2	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	4
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	1	—	—	—	3
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	2
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	2	1	—	—	—	—	2	7	2	8	1	5	2	5	1	6	—	1	—	—	2	2	1	—	48

 a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1—1.25	—	—	—	—	—	—	—	—	2	—	1	—	—	—	1	—	—	—	—	—	—	1	—	—	—	5
1.25—1.5	—	1	—	—	—	—	—	—	1	—	—	—	1	1	—	1	—	—	1	—	—	—	1	—	—	7
1.5—1.75	—	—	—	—	—	—	—	—	1	1	1	—	2	1	—	—	2	—	—	—	—	—	—	—	—	8
1.75—2.0	—	—	1	—	—	—	—	—	2	—	1	—	—	—	1	—	1	—	—	—	—	1	—	—	—	7
2.0—2.25	—	—	—	—	—	—	—	1	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
2.25—2.5	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	3
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	2
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2
3.0—3.25	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.5—3.75	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
3.75—4.0	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
over 4.0	—	—	—	—	—	—	—	—	1	—	2	—	—	—	2	—	—	—	1	—	—	—	—	—	—	6
Total	—	2	1	1	—	—	—	1	8	2	10	1	4	2	6	1	5	—	2	—	—	2	2	1	—	51

v/ms^{-1} Φ [illegible]

$$b/m$$
[illegible]

v_c/ms^{-1} a/b [illegible]

FEBRUARY 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
15	—	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
25	—	—	1	—	—	—	—	—	1	—	1	—	—	—	1	1	—	—	—	—	—	—	—	—	—	5
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	4
75	—	—	—	—	—	—	—	—	—	1	3	—	—	—	2	—	1	—	—	—	—	—	—	—	—	7
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
215	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
255	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
355	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	1	—	—	—	—	—	5	1	8	2	1	—	6	2	6	1	—	—	—	—	1	1	—	36

Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	4
30°	—	—	—	—	—	—	—	—	—	—	2	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
60°	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	3	—	—	—	—	—	—	—	—	5
90°	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	1	1	—	—	—	—	—	—	—	—	4
120°	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
150°	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	1	—	4
210°	—	1	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	4
240°	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	1	—	—	—	—	—	1	—	—	5
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
300°	—	—	1	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	1	1	—	—	—	—	—	6	1	9	2	2	—	7	2	8	—	—	—	—	—	1	1	—	41

FEBRUARY 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	2	—	—	—	—	—	—	—	—	—	4
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2
155	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	3
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	2
205	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
265	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
305	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
315	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
Total	—	1	1	—	—	—	—	—	4	1	6	2	1	—	5	2	6	1	—	—	—	—	1	1	—	32

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
30°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
60°	—	1	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
90°	—	—	1	—	—	—	—	—	—	—	2	1	—	—	—	—	3	—	—	—	—	—	1	—	—	8
120°	—	—	—	—	—	—	—	—	—	1	5	1	1	—	4	1	5	1	—	—	—	—	—	1	—	20
150°	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	4
180°	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Total	—	1	1	—	—	—	—	—	6	1	9	2	2	—	6	2	8	1	—	—	—	—	1	1	—	41

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	1	1	—	—	—	—	—	1	—	2	—	1	—	3	—	—	—	—	—	—	—	1	—	—	10
375	—	—	—	—	—	—	—	—	3	—	2	2	1	—	1	2	3	—	—	—	—	—	—	1	—	15
625	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	1	—	—	—	—	—	—	—	3
875	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	3
1125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
1675	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
2125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	—	1	1	—	—	—	—	—	4	1	6	2	2	—	5	2	8	1	—	—	—	—	1	1	—	35

FEBRUARY 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	—	1	—	—	—	—	—	—	—	2	—	—	—	—	1	1	—	—	—	—	—	1	—	—	6
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
65	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	2
115	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
135	—	—	—	1	—	—	—	—	1	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
265	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	—	1	1	—	—	—	—	—	4	1	6	2	1	—	4	2	5	1	—	—	—	—	1	1	—	30

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
1.25—1.5	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1.5—1.75	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1.75—2.0	—	—	—	—	—	—	—	—	—	1	1	—	—	—	1	—	—	1	—	—	—	—	—	—	—	4
2.0—2.25	—	—	—	—	—	—	—	—	2	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	5
2.25—2.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
3.0—3.25	—	—	—	—	—	—	—	—	—	—	2	—	1	—	1	—	—	—	—	—	—	—	—	1	—	5
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
3.5—3.75	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	3
over 4.0	—	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
Total	—	1	—	1	—	—	—	—	4	1	7	2	1	—	5	2	8	1	—	—	—	—	—	1	—	34

MARCH 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
15	—	—	—	—	2	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	4
25	—	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
35	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3
45	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
75	1	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
85	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
125	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
205	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
265	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Total	1	1	1	—	3	—	2	2	4	2	5	1	—	1	—	2	6	2	1	1	1	—	—	—	—	36

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	1	—	—	—	—	1	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	3
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
120°	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
150°	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
180°	1	—	—	—	1	—	2	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
240°	—	—	—	—	1	—	1	—	2	—	—	—	—	—	1	—	—	—	—	1	—	—	—	—	—	6
270°	—	—	—	—	1	—	—	—	—	2	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	5
300°	—	—	—	—	—	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	3
330°	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
Total	1	1	1	—	4	—	4	—	4	1	5	1	1	—	1	2	6	2	1	1	1	—	—	—	—	37

MARCH 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	2
25	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
65	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	1	—	—	—	—	—	4
95	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	3
105	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
115	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
235	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
265	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	1	—	3	—	1	2	4	2	5	1	—	—	1	2	5	2	1	1	—	—	—	—	—	33

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
30°	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
60°	—	—	—	—	1	—	1	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
90°	—	1	1	—	2	—	—	—	1	—	—	1	—	—	1	—	—	1	—	1	—	—	—	—	—	9
120°	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	4	1	1	—	1	—	—	—	—	9
150°	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	2	1	—	—	—	—	—	—	—	—	6
180°	—	—	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
Total	1	1	1	—	3	—	2	2	4	2	5	1	—	—	1	2	6	2	1	1	1	—	—	—	—	36

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	1	—	2	—	2	—	1	1	3	1	—	—	—	2	4	1	—	1	1	—	—	—	—	20
375	1	—	—	—	—	—	—	—	1	1	1	—	—	—	1	—	1	1	—	—	—	—	—	—	—	7
625	—	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
875	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
1875	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	—	1	—	3	—	2	2	3	2	4	1	1	—	1	2	6	2	—	1	1	—	—	—	—	33

MARCH 1959

 v_0/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	3
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
35	—	1	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
55	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	1	—	—	—	—	—	—	4
65	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
85	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	1	—	3	—	1	2	4	2	5	1	—	—	1	2	5	—	2	1	—	—	—	—	—	31

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2
1.25—1.5	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1.5—1.75	—	—	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1.75—2.0	1	—	—	—	—	—	—	—	1	1	2	—	—	—	—	—	2	—	—	—	—	—	—	—	—	7
2.0—2.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	2
2.25—2.5	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
2.5—2.75	—	1	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
3.0—3.25	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
over 4.0	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	3
Total	1	1	1	—	2	—	—	2	3	2	5	1	—	—	1	2	5	2	1	1	—	—	—	—	—	30

APRIL 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
15	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	1	—	—	3
25	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3
35	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
315	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Total	—	—	—	—	—	1	1	—	7	—	—	1	—	—	—	—	1	2	1	1	2	1	1	—	—	19

 ϕ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	1	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	4
60°	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	4
90°	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
180°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
240°	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
300°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
330°	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	3
Total	—	—	—	1	—	1	1	—	8	—	—	1	—	—	—	—	—	3	1	1	2	1	1	—	—	21

APRIL 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	3
55	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
215	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Total	—	—	—	1	—	—	1	—	6	—	—	1	—	—	—	—	—	1	2	1	2	1	1	—	—	17

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
30°	—	—	—	—	—	1	—	—	5	—	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	9
60°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
90°	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3
120°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
150°	—	—	—	—	—	—	—	—	2	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	4
180°	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	1	—	1	1	—	8	—	—	1	—	—	—	—	—	2	2	1	2	1	1	—	—	21

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	—	2	—	—	1	—	3	—	—	—	—	—	—	—	—	2	—	1	1	—	—	—	—	10
375	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
625	—	—	—	—	—	1	—	—	4	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	6
1125	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1625	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	2	1	1	1	—	8	—	—	—	—	—	—	—	—	2	2	1	1	—	—	—	—	19

APRIL 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
35	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2
45	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
295	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	—	—	—	1	—	7	—	—	1	—	—	—	—	—	2	1	—	1	1	1	—	—	15

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.25—1.5	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	4
1.5—1.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	3
1.75—2.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.0—2.25	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2.25—2.5	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.75—3.0	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
over 4.0	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	3
Total	—	—	—	—	—	—	1	—	7	—	—	—	—	—	—	—	—	2	2	1	2	1	1	—	—	17

MAY 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	2	—	—	—	—	1	—	5
75	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
235	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
295	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
Total	1	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	2	1	—	1	2	—	17

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	4
30°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	2
150°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
180°	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
210°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
240°	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
270°	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
300°	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2
330°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	3
Total	1	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	2	1	—	1	2	—	17

MAY 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
65	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
115	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2
155	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
275	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	1	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	1	—	—	1	1	—	14

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
30°	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	1	1	—	6
60°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
120°	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	3
150°	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	4
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
Total	1	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	2	1	—	1	2	—	17

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	4
375	—	—	—	1	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	6
625	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	4
875	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
1125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
Total	1	—	—	1	1	1	1	1	2	—	—	—	—	—	—	—	1	—	2	1	1	—	1	2	—	16

MAY 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2
85	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
125	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
135	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	3
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
265	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
Total	—	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	1	—	—	1	1	—	13

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.25—1.5	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	5
1.5—1.75	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
1.75—2.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
2.0—2.25	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2
2.25—2.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.5—2.75	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
over 4.0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	—	—	1	1	1	1	—	2	—	—	—	—	—	—	—	1	1	2	1	—	—	1	1	—	14

JUNE 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
15	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
85	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	2
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	2
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	1	—	—	1	—	12

 Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
60°	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
150°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	3
240°	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2
270°	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	1	—	—	1	—	12

JUNE 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
115	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	—	—	—	1	—	11

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	—	1	—	—	—	—	5
30°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
120°	—	—	—	—	—	—	1	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	1	—	—	1	—	12

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
375	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	5
625	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	4
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	—	—	—	—	—	10

JUNE 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
95	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
105	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
115	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	1	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	—	—	—	—	1	—	10

 a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
1.25—1.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	2
1.5—1.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
1.75—2.0	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
2.0—2.25	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2.25—2.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.75—3.0	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.5—3.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	1	—	—	—	—	—	1	1	3	—	—	—	—	—	—	—	—	1	2	1	—	—	—	—	10

v'/ms^{-1} [illegible]

$$b/m$$
[illegible]

v_c/ms^{-1} [illegible]

OCTOBER 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	1	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
15	—	—	—	1	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
25	—	—	—	—	1	—	—	—	—	—	—	—	1	—	1	—	—	1	—	—	1	—	—	—	—	5
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
45	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	4
55	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	5
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
85	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
95	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
115	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
485	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	1	2	1	2	1	1	14	—	—	—	2	—	3	—	6	2	1	1	1	1	—	—	—	39

Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	1	—	—	2	—	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6
30°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60°	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
90°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	2
120°	—	—	—	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	4
150°	—	—	—	—	—	—	—	1	4	1	1	—	—	—	1	—	2	1	—	—	—	—	—	—	—	11
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
210°	—	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	5
240°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	2
270°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
300°	—	—	—	—	—	—	1	—	3	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	6
330°	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	3
Total	—	—	1	2	1	2	1	2	14	1	1	—	2	—	3	—	7	2	1	1	1	1	—	—	—	43

OCTOBER 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
35	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
45	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
85	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	1	1	—	—	—	4
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
125	—	—	—	—	—	—	1	—	2	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	5
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	1	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	2
205	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
225	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
245	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
325	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
345	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
395	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	1	2	1	1	1	2	13	—	—	—	2	—	3	—	5	2	1	1	1	1	—	—	—	37

φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	4
30°	—	—	1	1	1	—	—	1	2	1	1	—	—	—	2	—	4	1	1	—	—	1	—	—	—	17
60°	—	—	—	1	—	1	—	—	1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
90°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
120°	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
150°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
180°	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	4
Total	—	—	1	2	1	2	1	2	3	1	1	—	2	—	3	—	7	2	1	1	1	1	—	—	—	32

 b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	—	—	1	1	—	—	—	—	9	1	1	—	1	—	2	—	3	2	—	1	—	1	—	—	—	23
375	—	—	—	—	1	1	—	1	5	—	—	—	1	—	1	—	2	—	—	—	1	—	—	—	—	13
625	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
1125	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	1	2	1	1	1	2	15	1	1	—	2	—	3	—	5	2	—	1	1	1	—	—	—	40

OCTOBER 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	2
25	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2
75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
85	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	2	—	—	—	1	—	—	—	—	4
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	4
125	—	—	—	—	—	1	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	4
135	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	4
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
185	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
205	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
225	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
335	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	2	1	1	1	1	12	—	—	—	2	—	3	—	5	2	1	1	1	1	—	—	—	34

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	1	—	—	—	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	4
1.25—1.5	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	1	—	—	—	—	4
1.5—1.75	—	—	—	1	—	—	—	1	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	5
1.75—2.0	—	—	1	—	—	—	1	—	1	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	5
2.0—2.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
2.25—2.5	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3
2.5—2.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
2.75—3.0	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.5—3.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
over 4.0	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	4
Total	—	—	1	2	1	1	1	1	10	—	—	—	2	—	2	—	6	2	—	1	1	1	—	—	—	32

a/b [illegible]

DECEMBER 1959

 v/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	1	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	4
15	—	—	—	—	—	—	—	—	—	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
25	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
35	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	2	1	—	—	—	—	—	—	—	5
55	—	—	—	—	—	—	—	—	2	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	4
65	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	4
85	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
115	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
145	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
195	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
295	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	2	—	—	—	1	1	—	1	9	2	4	—	1	—	5	—	6	3	1	1	—	—	—	—	—	37

Φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
0°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
30°	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
60°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
90°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
120°	—	—	—	—	1	—	—	—	—	—	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	4
150°	—	—	—	—	—	—	—	—	5	1	—	—	—	—	2	—	2	—	—	—	—	—	—	—	—	10
180°	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
210°	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	4
240°	—	—	—	—	—	1	—	—	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
270°	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
300°	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	2
330°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	3
Total	1	1	—	—	1	1	—	1	8	2	4	—	1	—	4	—	6	3	1	1	—	—	—	—	—	35

DECEMBER 1959

 v'/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
55	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
65	—	—	—	—	—	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	3
85	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
95	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	2
115	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	3
125	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	3
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
165	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2
175	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
185	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
235	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
265	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	—	1	1	—	—	7	2	4	—	1	—	4	—	6	3	1	1	—	—	—	—	—	31

 φ

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
30°	—	—	—	—	—	—	—	—	3	—	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	5
60°	—	—	—	—	—	—	—	—	4	1	3	—	1	—	1	—	4	1	—	1	—	—	—	—	—	16
90°	—	—	—	—	—	—	—	—	—	1	1	—	—	—	1	—	—	1	—	—	—	—	—	—	—	4
120°	—	—	—	—	1	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
150°	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
180°	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
210°	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	4
Total	1	—	—	—	1	1	—	1	8	2	4	—	1	—	4	—	6	3	1	1	—	—	—	—	—	34

b/m

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
125	1	1	—	—	—	1	—	—	3	2	3	—	1	—	3	—	3	2	—	—	—	—	—	—	—	20
375	—	—	—	—	—	—	—	—	3	—	—	—	—	—	1	—	2	—	1	1	—	—	—	—	—	8
625	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	2
875	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
1625	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	1	1	—	—	1	1	—	1	8	2	3	—	1	—	4	—	6	2	1	1	—	—	—	—	—	33

DECEMBER 1959

 v_c/ms^{-1}

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
55	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
65	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	1	—	—	—	—	—	—	—	3
75	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	1	1	1	—	—	—	—	—	—	5
85	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
95	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
105	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	2
115	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
145	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
155	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	2
165	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	—	3
175	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
185	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
195	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
245	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
405	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	—	—	—	—	1	1	—	1	7	2	4	—	1	—	2	—	6	3	1	1	—	—	—	—	—	30

a/b

Range	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total
1.0—1.25	—	—	—	—	—	—	—	—	2	1	1	—	—	—	1	—	—	—	—	—	—	—	—	—	—	5
1.25—1.5	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	—	1	—	—	—	—	—	3
1.5—1.75	—	—	—	—	—	—	—	—	2	1	—	—	—	—	1	—	3	—	—	—	—	—	—	—	—	7
1.75—2.0	—	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—	3	—	—	—	—	—	—	—	—	5
2.0—2.25	1	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
2.25—2.5	—	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	2	1	—	—	—	—	—	—	6
2.5—2.75	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2.75—3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.0—3.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.25—3.5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3.5—3.75	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	2
3.75—4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
over 4.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
Total	1	—	—	—	—	1	—	1	7	2	4	—	1	—	4	—	6	3	1	1	—	—	—	—	—	32

IV. SUMMARY PAPERS

4.1 THE MAIN RESULTS OF INVESTIGATIONS OF THE IONOSPHERIC DRIFTS IN THE USSR FOR THE IGY/IGC

S. F. MIRKOTAN^{o)}

Investigations of the irregular structure of the ionosphere were undertaken in Moskva, Gor'kij, Tomsk, Har'kov, etc. At the beginning of the IGY a network of drift stations was established. From 1957 regular observations co-ordinated with the IGY program were systematically started on these stations.

This report presents the main results of the IGY/IGC observations^{††}

It is necessary to note that the analysis of the IGY/IGC material is not yet finished.

1. The Network of Ionospheric Drift Stations

Methods of Investigation

During the IGY/IGC the regular drift observations were conducted at ten stations, the list of which is given in Table 1.

The maximum spacing between the stations was 70° in longitude and 30° in latitude. The method was vertical sounding of the ionosphere with spaced reception. Each station had three spaced antennae in a triangle with dimensions of 80 to 190 m. The amplitudes of the reflected signals were recorded.^{1, 2*} Most of the reductions have been carried out using the method of similarity[†]. The Moscow (MSU) station had a measuring triangle with sides from 28 to 62 km long and recorded phase differences of the reflected signals at three points.³ In this case the drift of the large-scale irregularities was observed. The high precision of the phase method made it possible to apply the correlation method to the large-scale irregularities.^{4, 5} An electronic computing technique was applied. Since 1959 another Moscow station (IZMIRAN) has processed its data twice with two different methods: that of correlation analysis and that of similar fadings. Drifts in *E*- and *F*- layers were recorded with a small time shift every hour. Since 1960 regular observations with *Es*-echoes were begun in Ašhabad and Rostov-Don.

* These and the following references see Part I-3(d)(ix), U. S. S. R., p. 6...8.

† *Annals of the IGY*, Vol. III, Part III.

^{o)} Moscow State University, U. S. S. R.

†† The Report includes data obtained by G. G. Džemilev, N. M. Erofeev, O. Ovezgel'dyev, V. P. Perelygin (Ašhabad); Ju. V. Kušnerevskij, E. S. Zajarnaja (Moskva, Izmiran); V. D. Gusev, S. F. Mirkotan, Ju. V. Berezin, M. P. Kijanovskij (Moskva, MSU); B. I. Kaščeev, I. A. Lysenko, V. I. Taran (Har'kov); S. S. Čavdarov, V. I. Pozigun (Rostov-Don); V. D. Kokourov, E. S. Kazimirovskij, V. M. Poljakov (Irkutsk); V. V. Filatov (Murmansk) and the results of these authors which are now deposited in WDC B 2.

TABLE 1. Ionospheric drift stations in the U.S.S.R. (IGY/IGC)

No	Station	Beginning of regular observations	Layer	Parameter and distances at spacing	Main method of processing	Remarks
1	Ashabad (AN TSSR)	I. 1958	F2	Amplitude 100 × 100 m	Method of similarity	Since May 1960, the observations on <i>E</i> s have continued. The processing was carried out with the help of the correlation analysis.
2	Gor'kij (NIRFI)	VII. 1957	<i>E</i> , F2	Amplitude 140 × 140 m	ditto	
3	Irkutsk (Sib. IZMIRAN)	IV. 1958	<i>E</i> , F2	Amplitude 120 × 120 m	ditto	
4	Moskva (IZMIRAN)	VII. 1957	F2	Amplitude 160 × 190 m	ditto	Since 1959 full correlation processing is being carried out.
5	Moskva (MSU)	VII. 1957	F2	Phase changes 28-62 km	Full correlation analysis	
6	Murmansk (PGI)	XI. 1958	<i>E</i> , F2	Amplitude 115 × 130 m	Method of similarity	
7	Rostov—Don (RSU)	IX. 1958	<i>E</i> , F2	Amplitude 130 × 130 m	ditto	
8	Simeiz (FIAN SSSR)	XII. 1957	<i>E</i> , F2	Amplitude 100—200 m	Method of similarity	The observations were stopped in January 1959. During 1955—56 radioastronomy observations of drifts had been carried out.
9	Tomsk (SFTI)	IX. 1957	<i>E</i> , F2	Amplitude 100—200 m	ditto	
10	Har'kov (KhPI)	VIII. 1958	<i>E</i> , F2	Amplitude 80 × 80 m and 100 × 100 m	ditto	Additional observations of meteor trail drifts.

The frequency used for the measurements was particularly chosen for each observation according to actual ionosonde observations.

For *F*2 observations the frequency was so selected that the virtual reflection height was nearly independent of frequency (and between *f*o*F*1 and *f*o*F*2 if *F*1 was present).

The observations were carried out according to the schedule of the IGY/IGC calendar. However, during a large proportion of the recommended days the ionosphere was in a disturbed condition. For this reason only about 30 percent of the data could be processed with the simple method of similarity. In order to increase the amount of data, additional days of observation were introduced according to special instructions⁶.

At present all indicated stations, except Simeiz, continue their observations. The exchange of data takes place according to international agreements. All primary drift data, obtained during the IGY, were sent to the WDC B2, and are being prepared for publication.

Apart from the standard observations some additional investigations were carried out with specially developed equipment (airplane observations, investigations of polarization influences on drift measurements, investigation of the three-dimensional parameters of irregularities, etc.). We shall present some major results of these researches.

2. The Value and Direction of the Drift Velocity

Region E

The main results were obtained with small antennae spacing at frequencies of 2–3 MHz. In this case the value v' and direction (angle Φ') of the effective (apparent) velocity were obtained.* The distribution of v' was observed in the 10–200 m/sec range at all stations. The most probably value of v' was found to be in the 40–80 m/sec range.

In most cases this range was 60–80 m/sec. It is interesting to note the great similarity of the v' distributions for different stations especially when averaging over a long period (a year, a season).^{7, 8}

TABLE 2. Available data during the IGY/IGC

No.	Station	Total number of observations,			
		Months	Days	Processed observations, h	Method of observations
1	Ashabad	24	254	1590	(2)
2	Gor'kij	30	323	749	(2)
3	Irkutsk	18	161	650	(2)
4	Moskva (MSU)	28	113	1209	(1)
5	Moskva, (IZMIRAN)	30	285	1078	(2)
6	Murmansk	14	106	775	(2)
7	Rostov—Don	17	132	1142	(2)
8	Simeiz	11	71	542	(2)
9	Tomsk	26	221	848	(2)
10	Har'kov	29	201	1064	(2)

(1) Drift of large-scale irregularities.

(2) Drift of small-scale irregularities.

* The symbols v' , Φ' are used for the effective velocity of drift and v , Φ for the data obtained according to the correlation analysis.

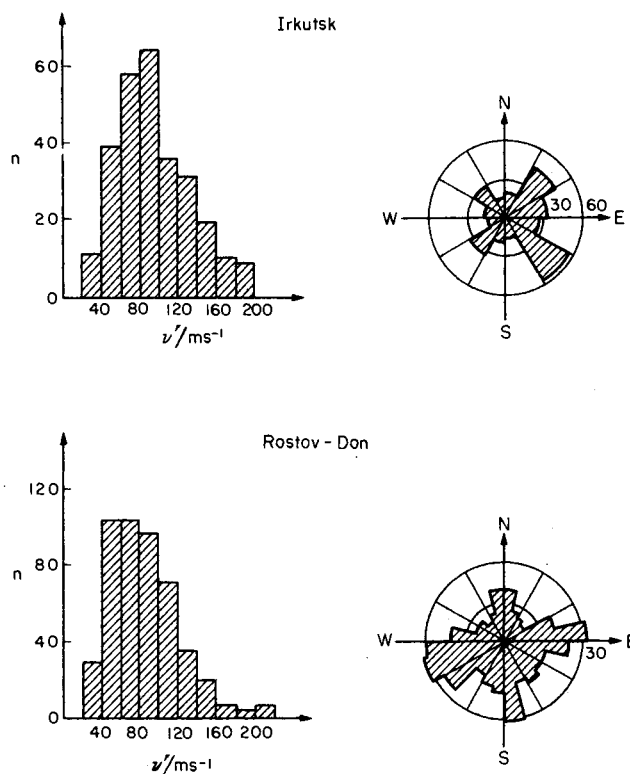


FIG. 1. Histograms of v' and Φ' for Irkutsk and Rostov-Don (1958-59) (E-layer).

In Fig. 1 distributions of v' , Φ' are given for Irkutsk and Rostov-Don.^{8, 10} At stations more to the South the smaller v' values are more frequent (Rostov-Don: 50–60 m/sec; Tomsk: 60–80 m/sec; Irkutsk: 80–100 m/sec). All stations indicate an increase of v' in the winter months. The monthly mean values of v' are given in Fig. 2. In the summer v' is of the order 65 m/sec, while it is 100 m/sec in the winter. The most probable values of v' for Irkutsk were 60–80 m/sec (in summer) and 100–120 m/sec (in winter). Comparing meteor drift observations¹¹ and ionospheric drift measurements⁹ we come to the conclusion that the relationship between the magnetic activity (K-index) and the value v' is either completely absent, or is very weak.

In Table 3 the predominant directions of the drifts for some of the USSR stations according to the IGY/IGC data are given. For comparison the data obtained at Cambridge* are also indicated.

* SHIMAZAKI, T., (1959) *Rep. Ion. Space Res. Japan* 13, 21.

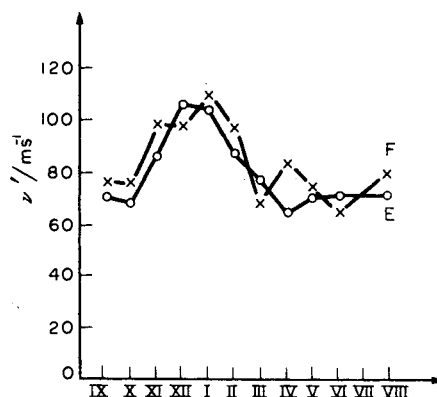


FIG. 2. The monthly mean velocity, v' , of the apparent drift, E - and F^2 -layers (1958-59). Rostov-Don.

TABLE 3.

IGY/IGC stations	Predominant drift directions in the E -layer
Rostov-Don	NE; SW
Har'kov	NE; SW
Irkutsk	SE; SW
Tomsk	NE; SW
Gor'kij	NE; SW
Cambridge	NE; SW

Apart from the steady component, which changes with season, height, and latitude, there are diurnal and semi-diurnal components of the drift vector.⁸⁻¹⁰ At all stations the semi-diurnal component was predominant. Also at Irkutsk this component is present for all periods of observation, though in summer and autumn it is very weak. As expected for the northern hemisphere the vector of the drift has a clockwise rotation.[†]

As the observed movement includes several superimposed periodic components with variable phases the comparison with a general circulation theory is difficult. A contribution to this question may be obtained by comparing the drift of meteoric trails and ionospheric irregularities simultaneously. In the E -layer the ionized component is a passive admixture which must be carried away with the neutral gas.¹¹ If the comparison is successful the ionospheric and meteoric drifts can be related to the actual winds, v . In Fig. 3 the data are given for a harmonic analysis of the NS and EW meteoric drift components for Har'kov [March-May 1960].¹⁰ The stable character of the movements at the E -layer

† MARTYN, D. F., (1947) *Proc. Roy. Soc. (Lond.) A* 189, 241.

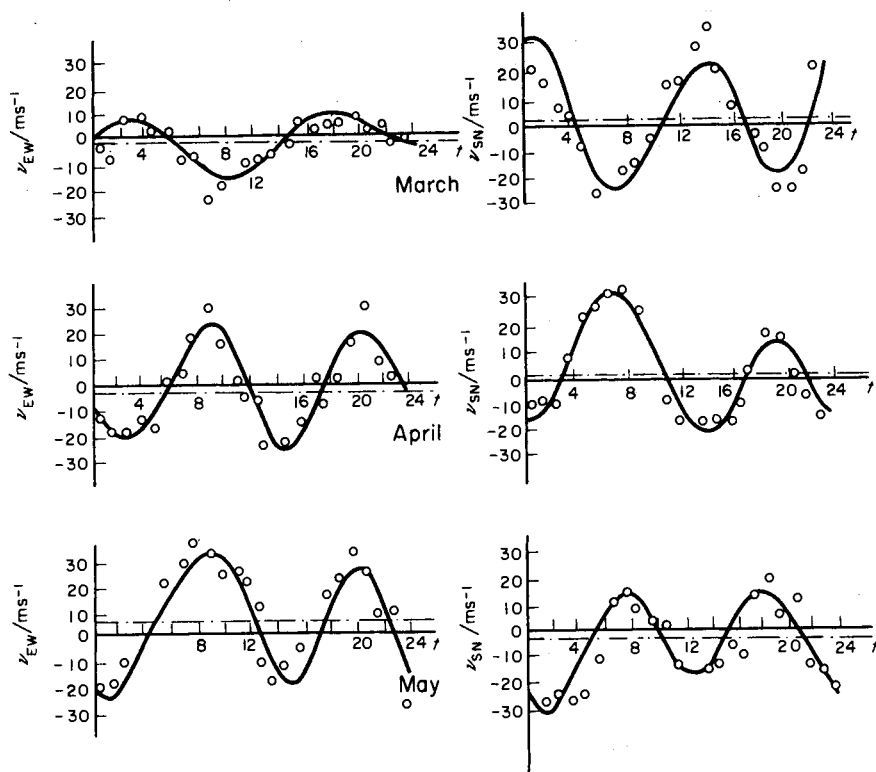


FIG. 3. Steady components and monthly mean diurnal variations of the EW and SN components of the meteoric drift. Har'kov (March–May, 1960).

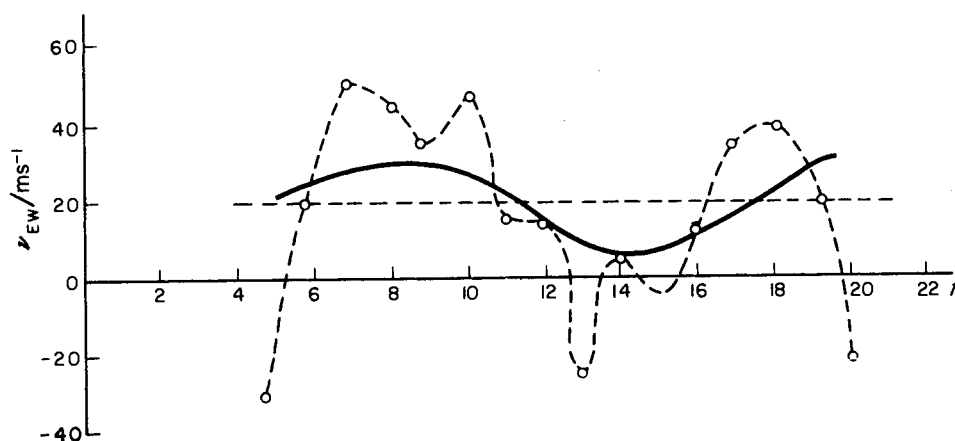


FIG. 4. Mean diurnal variation of the EW drift component, E-layer, Har'kov (March–May, 1960).

level and intense semi-diurnal wave are clearly visible. These data are similar to those obtained at Jodrell Bank[†]. At 06.00 local time we observe the northern direction; this is not too far from 07.00 local time as predicted by the tidal theory. Figure 4 shows that results of harmonic analysis of drift v' are considerably larger than for the meteoric drift v . This disagreement might be the consequence of the difference in the heights of the drifts. If this is true we could report a satisfactory qualitative agreement with the theory.

As a development of the IGY/IGC program, Ashabad began regular observations of movements in the E_s -layer (from May 1960). Both the small spaced reception and the correlation analysis were used on a frequency of 4.1 ± 0.9 MHz^{12, 13}. The E_s drift velocities lay within 10–350 m/sec, but the most probable value was within 48–75 m/sec. It was noted that the predominant drift directions were 100° (day-time) and 215° (night-time). The relationship between v' and magnetic activity was absent until $K = 5$. The semi-diurnal component exists; relationships with meteoric data were not obvious.

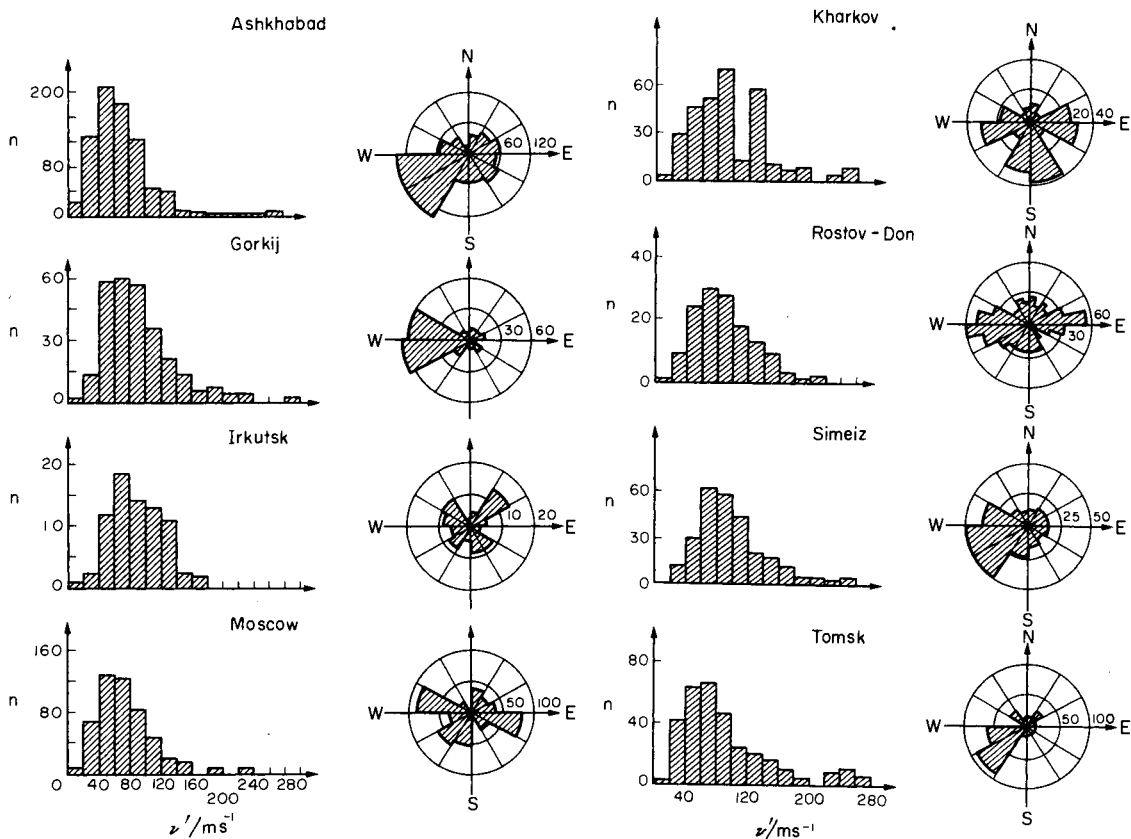


FIG. 5. Histograms of v and Φ' as whole year distributions for the drift stations of the U.S.S.R. 1958.

[†] GREENHOW, I. S. AND HALL, J. E., (1960) *J. Atm. Terr. Phys.*, 18, 203.

Region F

A more careful analysis was carried out of the $F2$ -layer data. The observation of the small-scale irregularities revealed common features of the drifts at all stations.

The value of v' varied from 10 to 500 m/sec. There is good similarity in the overall statistical distributions of v' for different seasons, years, and stations as for the E -layer.^{7-9, 14-17} The most probable values are found within 60–80 m/sec. Regular seasonal, latitudinal or longitudinal variations were not found. For example, in Fig. 5 a, b, the distributions of v' for all stations are given for 1958 and for Rostov for 1950–59. As a rule v' slightly increased at night. In contrast to E the $F2$ -layer shows a significant relationship between the magnetic activity and v' . This relation is shown with the data of Tomsk in Fig. 6.⁸ The EW direction of the drifts was dominant for nearly all stations (at night: W; in the daytime: E). For Irkutsk and Har'kov it was difficult to distinguish a steady component; this may be a consequence of insufficient data. Figure 5 also shows histograms of Φ for 1958.

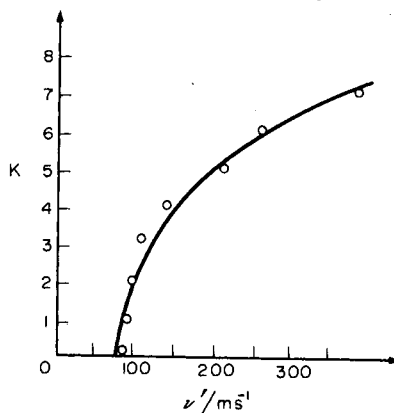


FIG. 6. Relation between drift velocity, v' , in the $F2$ -layer and magnetic activity index K . Tomsk.

The data of some stations (Moskva, Ašhabad, Tomsk, Irkutsk) were processed by harmonic analysis. The most careful processing was carried out for the data of the Moskva (IZMIRAN) station for the period from 1956 to 1959. It was found that the most important component in the $F2$ -layer is a diurnal one.

The analysis revealed that the diurnal EW component has amplitudes in the 11–46 m/sec range with 26 m/sec as mean value. The maxima were 2–3 h after noon and midnight. The second harmonic has smaller amplitudes, the mean value was 16 m/sec, but it was difficult to establish clearly the phase of this harmonic. These data are in qualitative agreement with tidal theory. The same conclusion was obtained for the data of other stations.^{8, 9, 16} The first harmonic of the NS component was in the 1–57 m/sec range and had 16 m/sec as mean value, less than tidal theory predicts. Its maxima were at 06.00–08.00 and 16.00–18.00 local time, which does not agree with present tidal theory. As a rule the rotation of this component was clockwise.

* The data and calculations were carried out and presented by Ju. V. Kušnerevskij (Moskva IZMIRAN).

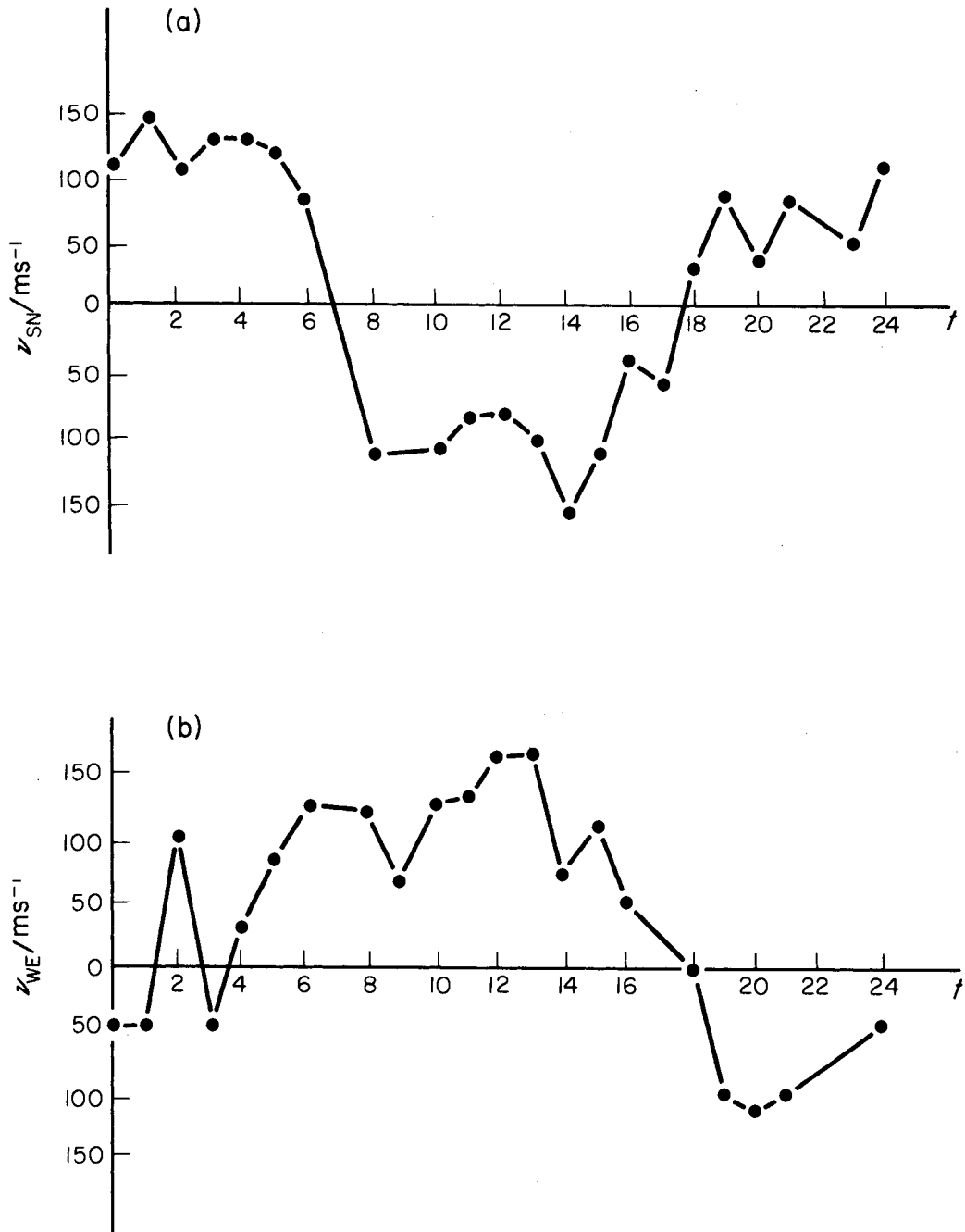


FIG. 7. Mean diurnal variation of the WE and SN drift components in the F_2 -layer obtained from observations of large-scale irregularities. Moskva MSU (1958).

The data we have do not allow us to conclude that there is full agreement with the tidal theory, but in many cases there is some quantitative support of the theory.

The phase drift observations of the large-scale irregularities (tens and hundreds of km as base length) were carried out in Moscow (MSU). The correlation analysis of the IGY/IGC data gave a rather wide scattering of the true velocity value, v , from 20 to 300 m/sec. The most probable value lies in the 85–170 m/sec range. According to other investigations[†] v should be found larger here than for small irregularities. A predominance of northern or southern directions was found. There is also a clear diurnal variation which is given in Fig. 7. Other investigators^{††} indicate eastern and western drift directions as predominant for these irregularities. The difference may be connected with the fact that no account was taken of the anisotropic form of the irregularities or of the preference for the anisotropy axis to have a certain orientation. In our case, with phase measurements processed by the correlation analysis, the prevalence of the SN component was detected. In fact a significant anisotropy and preferred orientation was obtained for large irregularities.^{18, 19} In Fig. 8 histograms of the different drift-velocities are given for 1957–58. v' obtained without taking into account the anisotropy (Fig. 8a) has a prevalence of a direction of 135° (EW). The same data processed by the correlation analysis (Fig. 8b) indicate a large SN component. As to the small-scale irregularities the simultaneous processing of the data for 1959¹⁴ confirmed the presence of mainly EW drift directions.

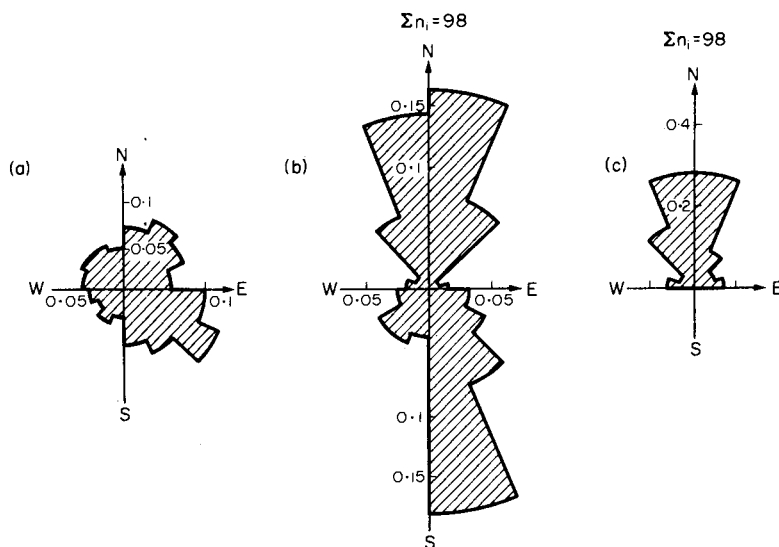


FIG. 8. Histograms of the drift direction as obtained: (a) not taking account of possible anisotropy; (b) considering anisotropy and turbulence; (c) histograms of the anisotropy directions. Moskva, MSU (1957–58).

[†] WELLS, H. W. (1957), *Polar Atm. Symp.* Pt. II p. 33. Pergamon Press.

^{††} THOMAS, L., (1959) *J. Atm. Terr. Phys.* 14, 123.

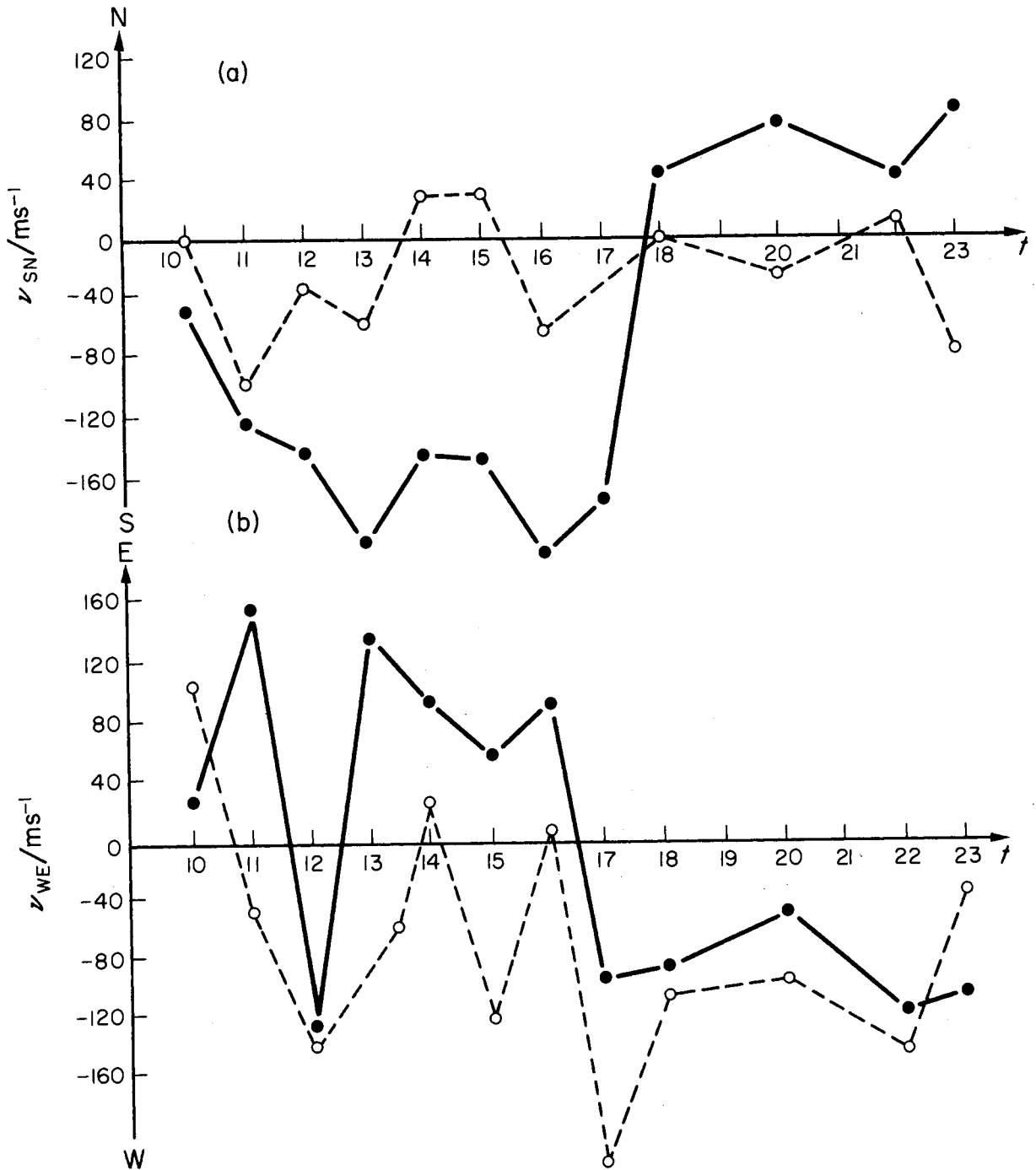


FIG. 9. 24 h variation of WE and SN components of the velocity of the drift for small-scale (dotted line) and large-scale (full line irregularities in the F_2 -layer, Moskva (October 10, 1958).

The spaced receiver investigations with the phase method were supplemented by investigation with frequency-shift with frequency differences from 0.5 to 4 MHz²⁰. These shifts correspond to vertical spacings of the reflecting levels of 5 to 25 km. For these experiments the common correlation analysis⁴ was generalized and applied to the media with three-dimensional characteristics.^{21*} These investigations indicate that there is a significant vertical drift component with the mean value of 12 m/sec the r.m.s. value being 85 m/sec.

The drift of large scale ionospheric disturbances (fronts from 400 to 1500 km) was determined from ionograms of the ionospheric stations Moskva, Leningrad, Sverdlovsk, Rostov, etc.²² The analysis of some 267 cases showed that the most probable effective speeds were 80–100 and 140–180 m/sec. Only the W direction was observed and the histogram showed mainly values in the 160–350° range.

An attempt was made to compare the drifts of small and large irregularities at the same point (Moskva).²³ The large irregularities have higher velocity, and the prevailing drift directions do not coincide, but 24 h observations showed that there is synchronism in the behaviour of the drift of the small and large irregularities. This synchronism is shown in Fig. 9. Observations of large-scale irregularities show that the observed phenomena are due to plasma waves in the ionosphere without any tidal character rather than to true movements of the medium. The synchronism, as shown in Fig. 9, indicates that there is a common cause that influences these processes.

3. Form and Orientation of the Anisotropy Axis and Random Changes of Irregularities

When dealing with "drifts" and "ionospheric irregularities" we are concerned with the structure of the diffraction pattern on the earth's surface. The general question arises how the structure of the pattern is related to the irregularities of the ionospheric plasma. It is true that there is some reason to suppose that the anisotropy axis and the drift direction of the diffraction pattern and of ionospheric irregularities sometimes coincide, but this is not so for the dimensions of the irregularities and their height localization. It is important to bear in mind this remark.

Some stations processed their records with the help of the correlation analysis. It was found that the ionospheric irregularities have rather pronounced anisotropy of form.^{12–14, 17, 18, 23–25} The mean value of the anisotropy ratio M for E_s and F -echoes varied from 1.4–2.7. For F_2 -echoes it lies in the 1.4–2.3 range. The direction of elongation is always near to the line of magnetic force with larger or smaller dispersion around this direction. This direction is particularly prominent for large-scale irregularities.¹⁸ So it can be supposed that the anisotropy of irregularities is related to the differences of the diffusion coefficients along and across the geomagnetic field. Initially isotropic irregularities stretch along the geomagnetic field.

Estimates of spreading time confirm this hypothesis²³.

Table 4 gives the mean and most probable values of the anisotropy ratio e , the angle φ between the SN direction and the major anisotropy axis, the characteristic velocity of the random changes v_c , and the ratio of v_c to the regular drift speed v .

* See also report by GUSEV, V. D. and MIRKOTAN, S. F. to the Ionospheric Symposium, Nice, Dec. 1961.

TABLE 4

Station	Parameter				Remarks
	e	φ	v_e	v_e/v	
Ashabad	2.7	At the day along the meridian	50 m/sec	0.9	E_s layer 3.2–5 MHz Data for 1960.
Moskva, IZMIRAN	2.3	50°, signif. dispersion	25–50 m/sec*	1.6	F_2 , 1959 (362 cases)
Moskva, MSU	2.3	0°	35–170 m/sec*	1.5	F_2 large-scale irregularities, 1957–58
Murmansk	1.9	–15° ... –55°*	—	0.6	F_2 , some cases
Rostov-Don	1.4–1.6*	—	—	0.8–1.2*	F_2 , 30 cases
Simeiz	1.6–1.8*	Signif. dispersion for $e < 5$ and SN orientation for $e > 10$	—	—	radioastron. observations (80 cases) relative to heights above F_2 peak

* most provable values.

According to simultaneous spaced and frequency-shift observations²⁰ the large-scale irregularities have an ellipsoidal form with the axes ratio 4:2:1. The major anisotropy axis was most frequently orientated in the NS direction with its northern end inclined towards the ground, i. e. towards the true direction of the inclined geomagnetic field, by an angle of 13.5°. The direction of the minor axis was close to the vertical. The large-scale irregularities occupy a considerable part of the F_2 -layer in height. Table 4 confirms that the ratio (v_e/v) reaches the value 1:1.5.^{13, 14, 18**} So the small-scale irregularities are to a great extent subjected to turbulent movements in the ionosphere.^{16, 23}

** YERG, D. G., (1957) *Techn. Rep. Solar Terr. Res. for 1956*, 1, 138.

4. Some additional investigations

Theoretical studies concerning the dynamics of the ionospheric plasma will not be reported here, since they are described in a special review article.¹¹

The localization in height of the ionospheric irregularities is still unsolved. The results of the observations of the signals of the first satellite on 40 MHz made it possible to determine the region of intensive occurrence of irregularities in the height range 270–325 km, and to evaluate the size of the irregularities.²⁶ These data are similar to the results obtained at another location.*

Aircraft observations of the drift in the Arctic region (83°N) have been carried out. It was found that the drift had a value of 50–70 m/sec in EW direction.²⁷

Particular studies of polarization²⁸ allowed us to estimate the influence of these effects on the drift measurements; certain recommendations are given to that effect.

Several investigations were made in order to check the applicability of the correlation analysis, and to promote its development.^{4, 21, 29–32} Resulting from these investigations a simple criterion was established for the applicability of data for the correlation analysis.^{31, 33} Indications have been made for taking into consideration the behaviour of the ionosphere and to minimize its influence on the drift results.³¹ A comparison of the correlation analysis and the method of similarity allowed us to show that the value and direction of drifts can be determined by the second simple method with sufficient accuracy.¹⁴

The analytic form of the plane correlation analysis was generalized for the three-dimensional case²¹; from this it is possible to obtain three-dimensional parameters of the large-scale irregularities and also the horizontal drift component v . It has been shown that the characteristic velocity of the random changes, v_c , obtained by the spaced reception method, may be overstated due to the presence of this vertical velocity component.

The influence of the specular component of the reflected signal on drift measurements has been investigated.³³ This study revealed the necessity for corresponding corrections.

5. Conclusion

The existence of irregularities and intensive regular movements (drifts, winds) are standard features of the ionosphere. In the lower ionosphere winds and drifts are observed with a dominating semi-diurnal component. The value and direction of the drift changes with height, latitude and season; such influences are subject to diurnal variations. There is no relationship between drift in the E layer and magnetic activity. Although there is quantitative agreement with the tidal theory, there are some difficulties in numerical comparisons.

In the F_2 -layer there is a steady drift which is primarily diurnal. Probably, the influence of the tidal lunar forces on the F -region is weak. The drift in the F_2 -layer is connected with the magnetic activity. The drift results obtained from large-scale irregularities differ from those obtained from small-scale ones. These differences indicate the existence of two processes in the ionosphere. One is the real wind or drift of the medium, and the other might be plasma waves.

* KENT, G. S. and KOSTER, J. R., (1961) *Nature* 191, 1183.

The geomagnetic field has considerable influence on the form of ionospheric irregularities. The irregularities, particularly the large-scale ones, have an elongated shape along the geomagnetic field.

Data available support the theory of the origin of drifts in the $F2$ -layer due to the transit of the electric field from the E - to the $F2$ -layer, but the numerical comparison also indicates differences between the theory and the observations.

In order to solve these problems further studies should include complex investigations applying various methods of observation: surface sounding, radioastronomical and meteor observations, launching of rockets and satellites. The most promising and direct method is the application of rockets and satellites. It is expected that during the IQSY many problems connected with the problem of movements in the upper atmosphere will be solved. However, much can be done by the analysis of the great amount of the IGY/IGC materials. The difficulty lies in the reduction of this material.

It is vitally important, that the IGY/IGC data should be presented in a form suitable for quantitative and qualitative comparisons.

4.2. ANISOTROPY OF SMALL-SCALE IRREGULARITIES AND MOTIONS IN THE F_2 -LAYER

JU. V. KUŠNEREVSKIJ and E. S. ZAJARNAJA,*

THIS paper presents results of measurements of the motions in the F_2 -layer of the ionosphere for September 1959, reduced by both the similarity method and by correlation analysis.† The observations were made during eleven days of that month, according to the International Geophysical Cooperation Calendar, and for some supplementary days adopted specially by the Soviet Union stations. The schedule was 5 to 7 min every hour beginning on the hour. At night, however, it was often impossible to make observations because of strong interference by broadcasting and other stations or because of important spread. Therefore most of the measurements refer to the day-light hours. Altogether 106 measurements were made of which 44 only were treated by the similarity method.

1. Shape of Irregularities

The shape of the irregularities is represented as a "characteristic ellipse" (anisotropy ellipse). The axial rate of the ellipse, e , is a measure of its elongation, while the angle φ , defines the preferred elongation (the orientation of the major axis). From the distribution of e it has been found that its value varies from 1 (isotropic case) to 5.5, the most probable values ranging from 1.5 to 2. The average value is $e = 2.1$. No significant variation of e with time within the 24-hour period has been discovered, except that in the evening and at night values $e > 3$ were more frequent. Our data are in good agreement with those obtained by other authors. (5, 23, 24, 25)††

The distribution of the major axis orientation (values of angle φ) is presented in Fig. 1.

The range of variation φ is seen to be wide. The average value is $\varphi = -12^\circ$ and the most probable values of that angle lie close to the NS direction. This is particularly evident from the variation of φ with time in the course of 24 h. Before noon the most probable values of φ lie within $20-30^\circ$, while during afternoon hours they range within $40-50^\circ$. So it may be stated that small-scale ionospheric irregularities are elongated preferentially along the lines of force.

2. Size of Irregularities

The dimensions of small-scale irregularities were determined from the formula $\Delta = 2\tau_{0.5} v_c$, where $\tau_{0.5}$ is the radius of correlation defined as the time necessary to reduce the autocorrelation function down to 0.5, and v_c is the characteristic velocity along the major or minor axis of the anisotropy ellipse⁵.

* Izmiran, Moscow, U.S.S.R.

† *I.G.Y. Annals* vol. III, Part III (1956).

†† PHILLIPS, G. J. and SPENCER, M., (1955) *Proc. Phy. Soc. (London)* 68 B, 481.

These and the following references see Parts 1—3(d)(ix), U. S. S. R.

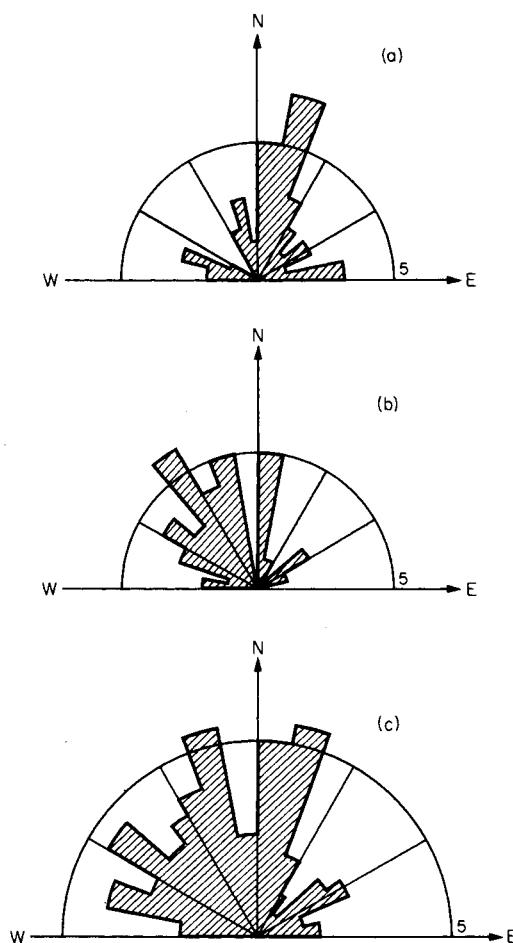


FIG. 1. Orientation distribution of the major axis of the anisotropy ellipse (September 1959): (a) 06.00–12.00; (b) 12.00–18.00; (c) for the 24 h. The number of cases is indicated along the radius.

Figure 2 shows the respective size distributions of the irregularities along the minor axis of the ellipse ($\Delta_{\min}$) and along its major axis ($\Delta_{\max}$). It may be seen that along the major axis the size of the irregularities, $\Delta_{\max}$, ranges from 200 to 3800 m, and along the minor axis, $\Delta_{\min}$, the range of variation is 0–3800 m. The most probable value for $\Delta_{\max}$ lies within 800–1000 m, while that for $\Delta_{\min}$ is within 200–400 m. The average values are $\Delta_{\max} = 1300$ m, $\Delta_{\min} = 660$ m. There is a pronounced decline in the size of the irregularities from day to night. Thus the average value of $\Delta_{\max}$ diminishes from 1220 to 860 m, and that of $\Delta_{\min}$, from 840 to 600 m.

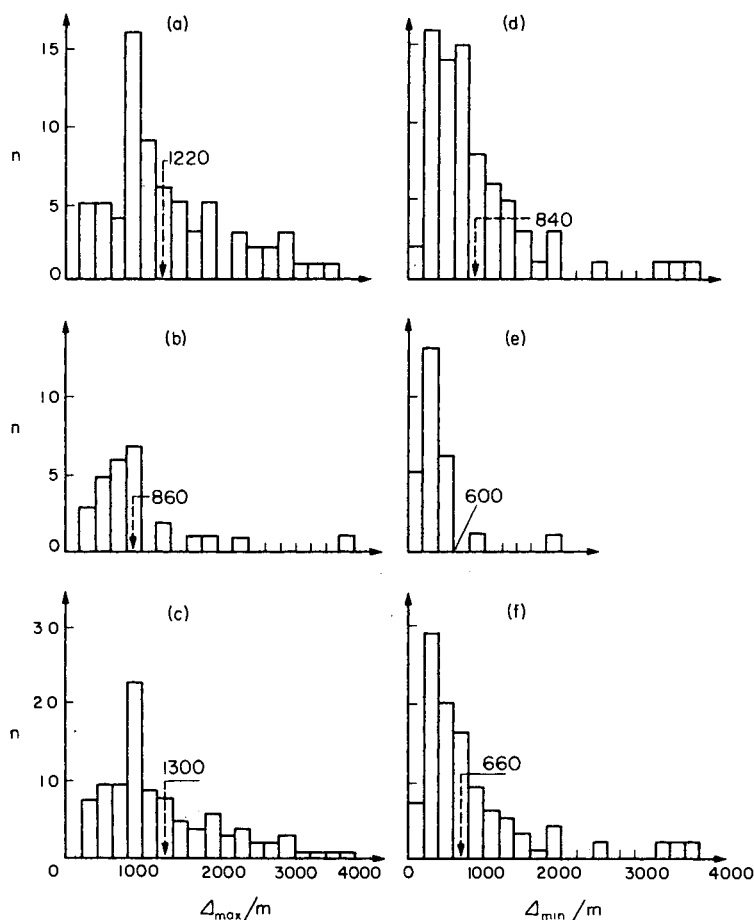


FIG. 2. Size distribution of irregularities (September 1959) along the major ($\Delta_{\max}$) and minor ($\Delta_{\min}$) axes of the anisotropy ellipse: (a) and (d) for 06.00—18.00; (b) and (e) for 18.00—06.00; (c) and (f) for the 24 h. Average values are indicated by arrows. The number of cases is plotted along the ordinate axis.

3. Drift of Irregularities

The velocity and direction of the drift of small-scale irregularities was determined by the similarity method (44 observations) and by correlation analysis (106 observations). It can be seen that the data dispersion has tripled as compared with the similarity method. Comparison of the mean time shifts, as determined by the two methods, show good agreement for most cases. In some examples, however, the similarity method gave a wrong time shift.

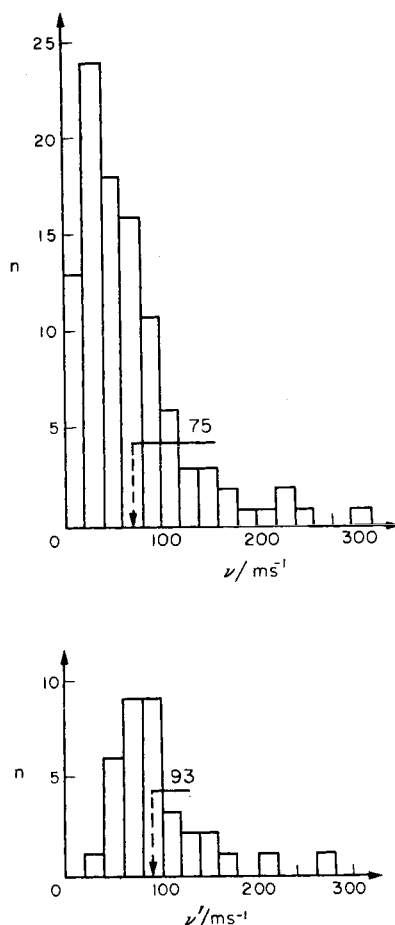


FIG. 3. Distribution of the drift velocity (September 1959): (a) correlation analysis; v (b) similarity method: v' . Average values are indicated by arrows. The number of cases is plotted along the ordinate axis.

In Fig. 3 distributions of the drift velocity v and apparent velocity v' as obtained by the similarity method are presented: v varies from 5 m/sec to 560 m/sec and v' , from 20 m/sec to 280 m/sec. The most probable values of the drift velocity v and the apparent velocity v' are between 20–40 m/sec and 60–100 m/sec respectively. It is evident that the drift velocities obtained by the correlation method are, as a rule, lower than those determined by the similarity method. The average values of the velocities v and v' are 75 m/sec and 93 m/sec respectively. The reason for the discrepancy is due to the fact that random processes play an essential part in the movements of ionospheric irregularities.

The direction of movement of the irregularities was likewise determined by both methods. The distribution of the drift directions is presented in Fig. 4.

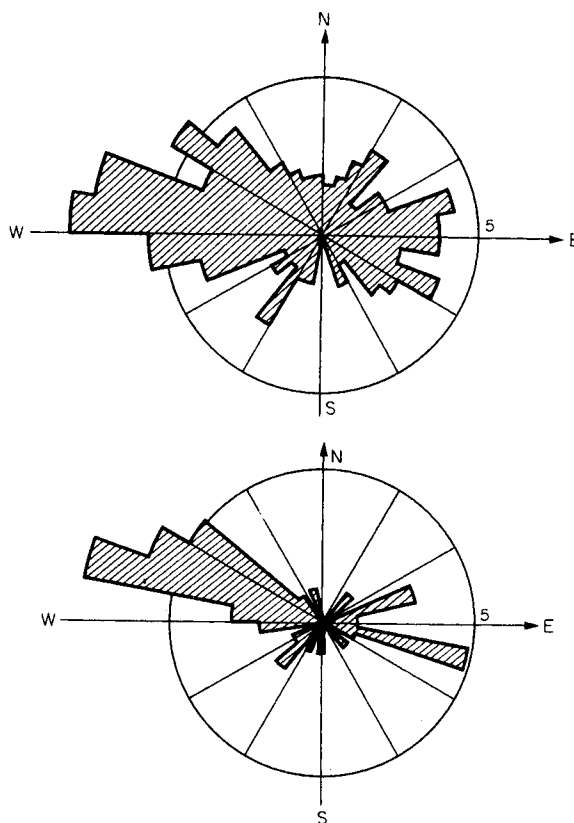


FIG. 4. Direction distribution of the movement of irregularities (September 1959): (a) correlation analysis; (b) similarity method. The number of cases is plotted along radius.

The agreement between the mean directions as determined by both methods is satisfactory. We mostly found western or eastern direction with a preference for the western direction. There is scarcely any movement toward the north or south. The most probable directions lie between 80 to 100° and 270 to 290° when determined by correlation analysis, and between 100 to 110° and 280 to 300° when determined by the similarity method. A diurnal variation of the drift direction has been found. The preferred direction was north-west at night, mostly west in the morning east or south-east in daytime and mainly west in the evening but eastern drift may also occur in the evening. The north-south and east-west components behave similarly, the former being northward at night and southward in the day-time, while the east-west component is westerly and easterly respectively.

4. The Velocity of Random Movements v_c and the "Life Time" of Irregularities, τ_c

In addition to drifts, random movements are of great significance in the ionosphere. The velocity of random movements is determined from the relation $v = \sqrt{v_c'^2 - v^2}$

where v'_c is the characteristic velocity, and v is the drift velocity. The velocity distribution of these movements in the $F2$ -layer shows that v_c ranges from 0 to 450 m/sec, the most probable values lying between 50 and 100 m/sec, while the average value is 107 m/sec. Occasionally the velocity of random motions becomes an imaginary quantity, i. e. v was larger than v'_c . It is of considerable interest to know the velocity ratio of random movements to regular drift, v_c/v . This ratio, which reveals the role of random processes in the ionosphere, has been found to vary from 0 to 7. Its most probable values lie within the range 0.5 — 1.0, but the average value is 1.6. Hence the velocity of random processes is generally higher than that of the regular drift of the irregularities.

Another characteristic parameter of small-scale irregularities in the $F2$ -layer is their "life time" τ_c .^{*} This value is determined from the relation $\tau = 2\tau_{0.5}(v'_c/v)$. τ_c has been found to vary from 2 sec to 36 s. The most probable τ_c values lie at 6.7 sec, while the average value is 9.8 sec. The lifetime distribution over 24 h shows that the average for the daylight hours is $\tau_c = 10.6$ sec and for the dark hours $\tau_c = 7.4$ sec. The decrease from day to night is directly related to the similar behaviour of the size of irregularities. This law of diurnal variation may be explained by diffusion processes.*

Conclusions

Ionospheric irregularities are considerably anisotropic. The average axial ratio of the anisotropy ellipse has been found to be about 2. The major axis tends to follow the direction of the magnetic meridian. The average sizes of small-scale irregularities along the major and minor axes of the ellipse are 1300 m and 660 m respectively. There is a reduction of size of about 1.4 times at night as compared to daytime.

In general, lower values are obtained for the drift velocity of small-scale irregularities when correlation analysis is used instead of the similarity method. This is due to the effect of the rather rapid random movements with an average velocity of 107 m/sec in the $F2$ -layer. The distribution of the ratios of random movement velocity to drift velocity shows that the most probable value of this ratio lies within the range 0.5 to 1.0, while its average value is 1.6. The drifts of small-scale irregularities in the $F2$ -layer have some preferred directions, their orientation being westward at night and eastward in the day-time. The westward component predominates. The north-south component of the drift velocity is oriented northward at night and southward in the daytime, while the direction of the east-west component is to the west at night and to the east in the day-time.

For the life time of small-scale irregularities an average of about 9.8 sec has been obtained, this value varying from 10.6 sec in day-time to 7.4 sec in the dark hours.

* ALPERT, JA. L., GINSBURG, V. L. and FEINBERG, V. L. *Rasprostranenie Radiovoln (Propagation of Radiowaves)*, Moscow, 1953.

4.3. CORRELATION ANALYSIS APPLIED TO MEDIA WITH THREE-DIMENSIONAL CHARACTERISTICS *

V. D. GUSEV and S. F. MIRKOTAN

THE paper gives a general correlation analysis for a Medium the properties of which vary at random with the *three* space coordinates and with time. The statistical distribution is supposed to be stationary in time, and homogeneous in space. The mean spatial characteristics of the irregularities, viz. anisotropy of the form, average dimensions of the irregularities, orientation of the main axes, drift velocity, v , velocity of the random changes, v_c , and some other parameters are determined.

The paper shows that the correlation analysis used at present for three-point measurements of the ionospheric irregularities is not applicable in the general case of the free orientation of the axes of the anisotropy and the presence of a vertical component, v_z , of the drift velocity. In this case, for instance, the velocity v_c , obtained with the three-point measurements, is larger than the true one on account of the presence of v_z . When applying usual three point measurements only the horizontal cross-section of the irregularities is determined,

* Full paper presented at the Nice Symposium of URSI (1961); published in Russian: ref. (21), p. 7.

4.4. STATISTICAL PROPERTIES OF THE IONOSPHERE[†]

V. D., GUSEV, S. F. MIRKOTAN, M. P., KIJANOVSKIJ and JU. V., BEREZIN.

THE properties of large-scale irregularities in the *F*2-layer and their effect on reflected radiowaves has been studied. At three points, spaced at 28—62 km, the variations of the phases of reflected signals were recorded. The method of correlation analysis was applied to study large-scale irregularities. Data are given on diurnal and seasonal variations of parameters of anisotropy, dimensions of irregularities, horizontal drift, etc.

Data were also obtained about the three-dimensional properties of irregularities, their orientation in space, the vertical component of the drift velocity, etc. (See preceding Chapter.

[†] Moscow State University, U. S. S. R. Full Paper presented at Nice Symposium (1961); published in Russian: ref. (31), p. 8.

4.5. SEASONAL ANOMALIES OF DRIFT DIRECTIONS IN THE LOWER IONOSPHERE REVEALED BY SPACED RECEIVER MEASUREMENTS IN THE *LF* RANGE

K. SPRENGER,*

DURING the IGY and the IGC, ionospheric drift measurements in the low frequency range have been performed at Kühlungsborn ($54, 1^{\circ}\text{N}$; $11, 8^{\circ}\text{E}$) with closely spaced receivers (600-m distance). The sky wave of a CW radio transmitter at 245 kHz, 180 km NNW of the receiving site was observed, the ground wave being suppressed by loop aerials. The similarity of the three fading traces was sufficiently good, and the time displacements of the individual fading maxima and minima amounted to several seconds. Records have been obtained continuously every night from sunset till 22.00 UT and from 04.30 UT till sunrise, always taking half an hour for one drift sample. The total number of statistically significant results was about 1000 during the period from 1957 to 1959. Since the reflection coefficient is only 0.1 or at most 0.2 it is believed that the results are not seriously affected by additional sky waves reflected more than once from the ionosphere. The reflection height is assumed to be between 90 and 100 km at night.

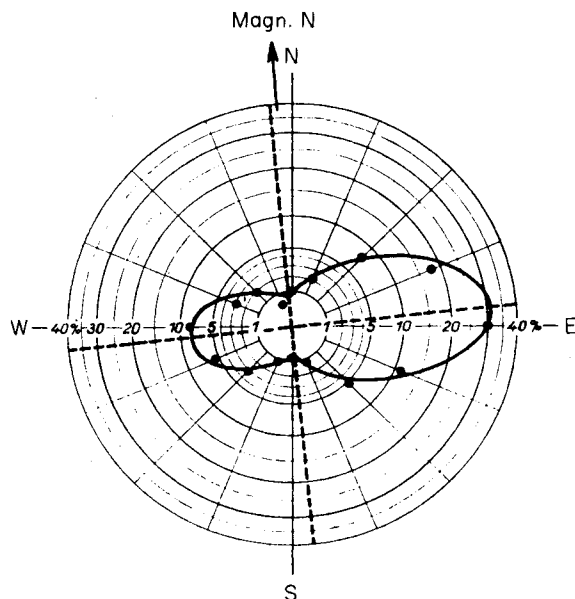


FIG. 1. Probability distribution of all night-time drift directions measured at Kühlungsborn from 1957 to 59 at 245 kHz. (The total number of individual observations is $n = 1010$. The dashed lines are the axes of symmetry of the distribution curve.)

* Observatorium für Ionosphärenforschung, Kühlungsborn, German Democratic Republic.

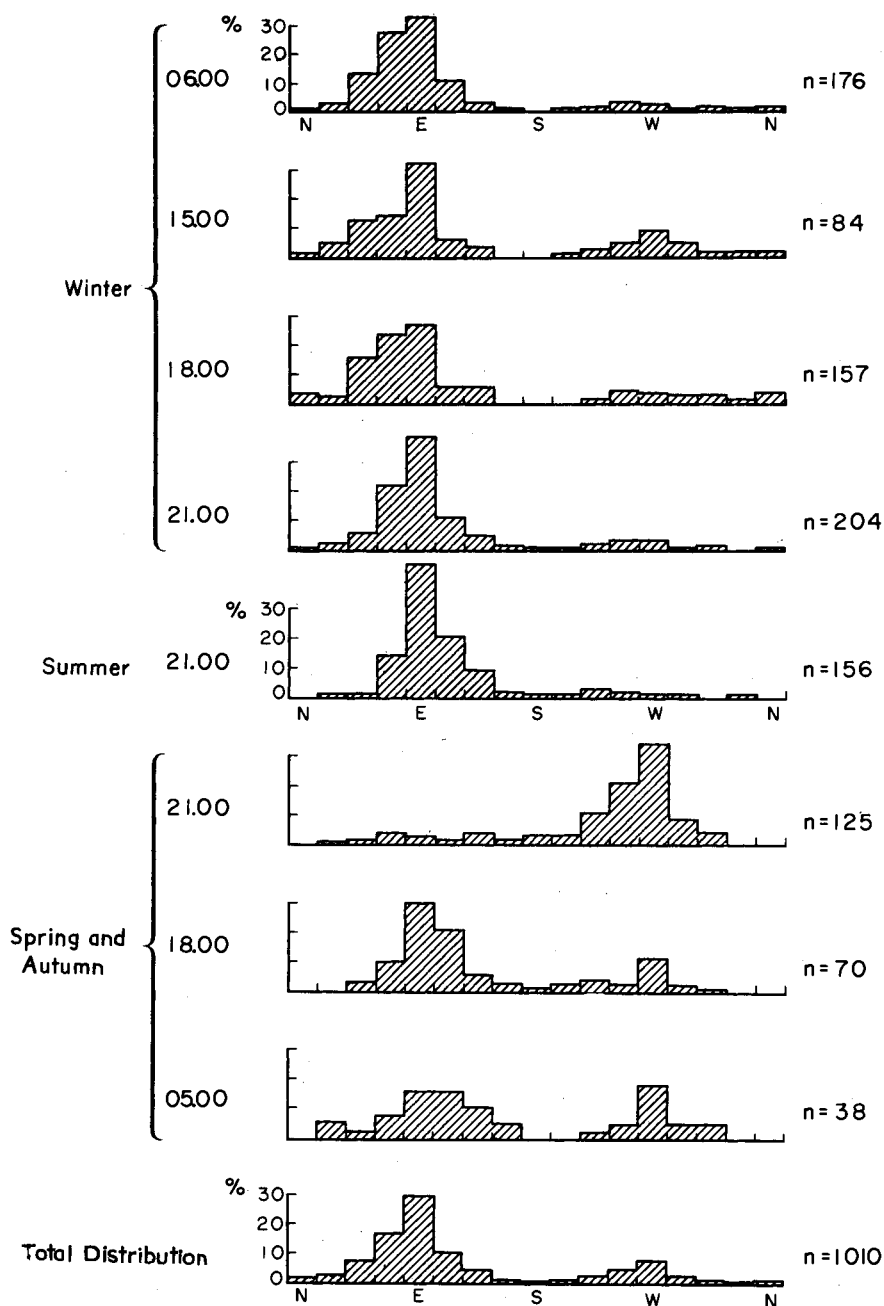


FIG. 2. Histograms of ionospheric drift directions measured at 245 kHz from 1957 to 59, produced separately for the various seasons (winter, summer, spring and autumn) and hours UT. (The bottom row is the sum of the eight rows above and is identical with Fig. 1.)

1. Results

The median drift velocity has been found to be 80 m/sec, with more than 90 per cent of all values between 40 and 160 m/sec. There was a tendency for slightly greater values in winter than in summer, for a slight increase of velocity during the night, and for strong increases during magnetic storms. The results have been obtained by the simple method of similar fades and not by a full correlation analysis. Thus, the velocities quoted above may be somewhat too great. But this fact does not affect the determination of the drift direction which will be dealt with now in this paper.

The overall probability distribution of all night-time drift directions observed at 245 kHz within the three years from 1957 to 1959 is shown in Fig. 1. It may be seen from this figure that the drift is almost entirely zonal, most frequently directed towards the east, less frequently towards the west, and extremely seldom towards the north or south. The declination being only a few degrees, no distinction between geographic and magnetic north could be made.

In Fig. 2 the probability distributions of drift directions are given separately for the various seasons and hours. There is a very clear predominance of eastern directions during winter and summer. During spring and autumn, however, the opposite direction is predominant, particularly in the later evening. All histograms show pronounced minima of occurrence at the directions south and north. At all seasons and hours, it is always more probable to get a direction opposite to the most probable one than perpendicular to it.

Figure 3 referring to 21.00 UT observations only (spring and autumn) shows distinct seasonal anomalies, occurring year by year at nearly the same dates. The spring anomaly

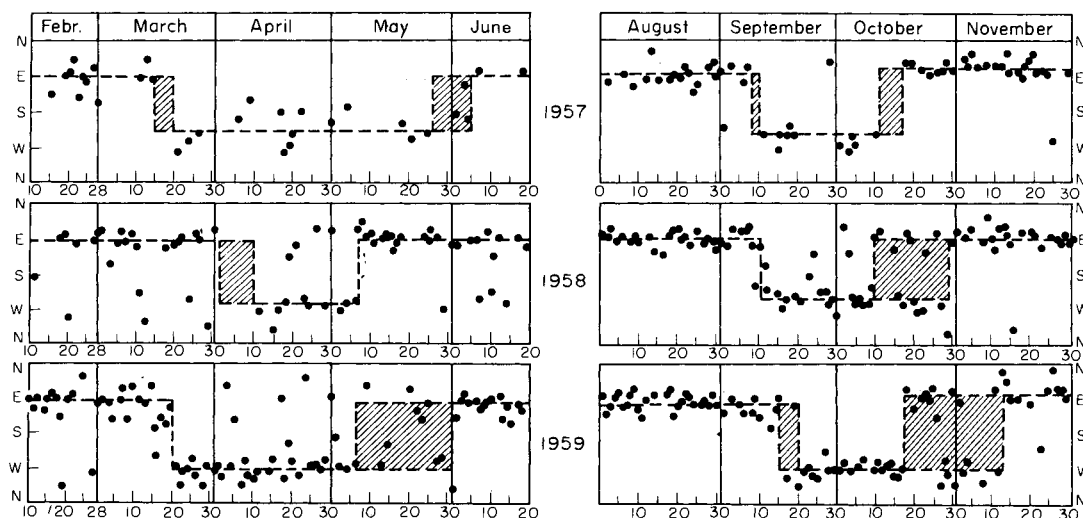


FIG. 3. Plots of the individual drift direction results obtained on 245 kHz at the 21.00 UT term. (The dashed lines represent the median values of the drift directions during the normal eastern and the abnormal western drift periods. The transition periods are marked by the hatched areas.)

lasts from the middle or end of March to May, and the autumnal anomaly from the middle of September to October. Sometimes the reversal is very abrupt from one day to the other. At other times we have a transition period of several days with alternating drift directions or without usable results; a gradual change-over has never been observed.

In Figs. 4 and 5 (diurnal variation) we distinguish only between the two main directions east (including NE and SE) and west (including NW and SW). The autumn anomaly

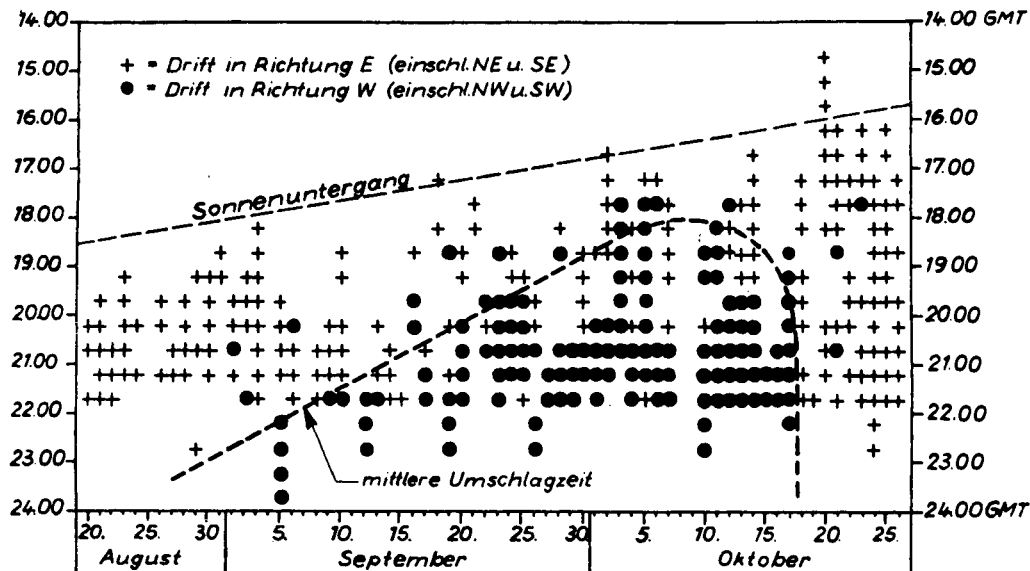


FIG. 4. The diurnal behaviour of the autumnal drift direction anomaly in 1959. (Normal eastern drift directions—including NE and SE—are marked by crosses. Abnormal western drift directions—including NW and SW—are marked by dots. The dashed lines represent the time of sunset and the mean time of the reversal, respectively.)

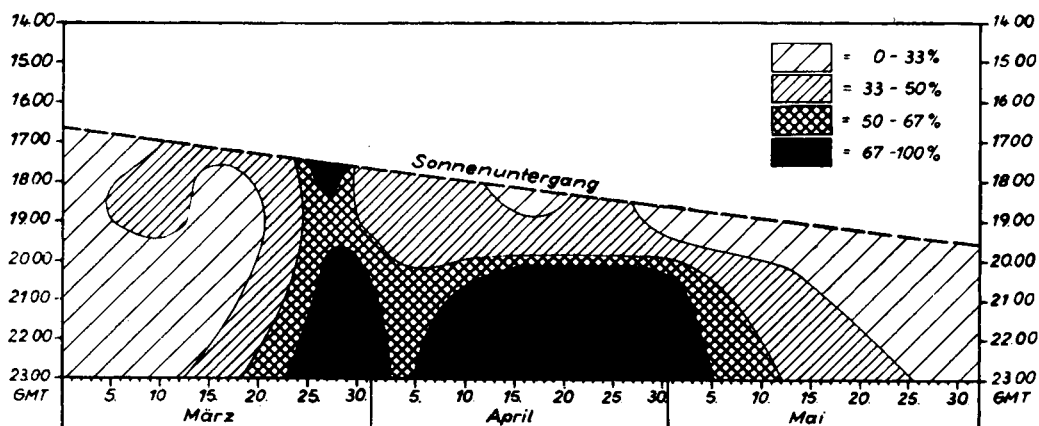


FIG. 5. The spring anomaly of drift directions (1957–59) as shown in terms of percentage of westerly directed drifts (including NW and SW).

consists in sudden reversals from east to west, occurring almost every evening after sunset. The average hour of the reversal lies first in the late evening hours, then with advancing season gradually approaches sunset until, by the middle of October, the anomaly disappears very suddenly from one day to the other. We obtain a corresponding picture in Fig. 5. The spring anomaly appears rather suddenly during the second half of March and gradually disappears in the late evening hours of May.

Unfortunately it has not been possible to make similar investigations for the early morning hours of spring and autumn because the observational material is too poor.

2. Discussion

One of the most striking results of the ionospheric drift measurements at 245 kHz mentioned above is the very narrow restriction of the observed drifts to the west-east direction. Fortunately this direction is nearly perpendicular to the plane of propagation; thus the phenomenon cannot be caused by phase effects between multiple components of the sky wave, which would result in apparent motions along the path of propagation. The phenomenon could be explained, however, if one assumed that the ionospheric irregularities in the reflection level are highly anisotropic. If they were extremely elongated in the direction of the geomagnetic field, it would only be possible to detect movements normal to it. But it is not believed that this can be the true cause of the observed lack of meridional drifts because such extreme anisotropy in the horizontal plane has never been found in the lower ionosphere at temperate latitudes. Thus we must conclude that the wind systems in the height range concerned are mainly zonal.

Furthermore, a striking feature of our results is that the drift often reverses very suddenly from the normal eastern direction to the opposite one, particularly in the evening hours of some weeks during spring and autumn. Because of the total lack of observations during day-light hours and from 23.00 UT to 04.30 UT we cannot decide whether these regular reversals are part of a general diurnal variation. In this case spring and autumn anomalies of the drift direction would be seasonal anomalies of the phase of that unknown diurnal variation. It is, however, highly improbable that such a general diurnal variation of the drift direction exists in winter; during this season the greater part of the day is covered by our observations. We suggest that the dates of the sudden appearance of the spring anomaly in March and of the sudden disappearance of the autumn anomaly in October may be connected with a fundamental conversion of the general circulation in the high atmosphere between summer and winter, as is known, for instance, from the lower stratosphere.

On the other hand, we must take into account that the reflection height of our wave is not constant throughout the night and year. Therefore our results may also be explained by a simultaneous existence of easterly and westerly directed wind systems, one closely above the other, the height of them varying diurnally and seasonally with respect to the reflection height of 245 kHz. In this case the spring and autumn anomalies of the drift direction would be seasonal anomalies of our reflection height relative to the height of the boundary between the two opposite wind systems.

4.6. DRIFT MEASUREMENTS OF THE *E*-REGION IN NORWAY AT KJELLER AND TROMSÖ

LEIV HARANG*

1. Place of observation: Kjeller, 59°58' N, 10°06' E.

Method of observations: similar fadings, received at three points placed in a right-angled triangle with bases of 130 m. Frequency: 2.1 MHz.

Method of recordings: The *E*-amplitudes were isolated through a gate and two methods of display were used, (a) the simultaneous recordings of the amplitudes on a 3-beam oscillograph, and (b) recordings of the relative time displacements between of the amplitude maxima using a Phillips recorder. The gate for isolating the *E*-echoes was placed in the interval 100–135 km height.

Presentation of the Results

At Kjeller the reflections from the normal *E*-layer are present only during a small number of hours each day in the winter season. Further, the Kjeller station was considerably disturbed during geomagnetic perturbations, *Es* is often present as irregular echoes or heavy absorption may occur which makes drift measurements impossible. It has therefore been difficult to obtain continuous measurements of the drift during a whole day or series of days, even during quiet periods. The material will therefore consist of a limited number of hourly values from various days. For the summer season the number is sufficient for obtaining the characteristic diurnal trend, for the winter season there have been difficulties in obtaining a sufficient number of hourly values.

The drift measurements at Kjeller were first conducted for about 14 months in 1954–55¹. In 1957–58 the drift recordings were continued with the same equipment. As an example of the monthly variation during summer time, the results from July–August 1957 are given in Fig. 1. In Fig. 2 are shown the wind vector diagrams during the summer season for the two periods of observation².

There is a close similarity between the values of the drift for the *summer* season during these two periods of recording. An harmonic analysis of the curves, using a three term Fourier representation $v' = a + c_1 \sin(t' + \epsilon_1) + c_2 \sin(2t' + \epsilon_2)$, gives the values listed on Table 1. The straightforward harmonic analysis of the material, comprising both the day and night portions (i. e. *E* and *Es* echoes) does not therefore seem to be physically justified. The diurnal (24 h) component which appears in the harmonic analysis and which is given in Table 1, seems conspicuous and may at least partly be considered as artificially introduced by adding together the *E*- and *Es*- drifts. ($t' = 15^\circ t/h$)

* Norwegian Defence Research Establishment, Kjeller.

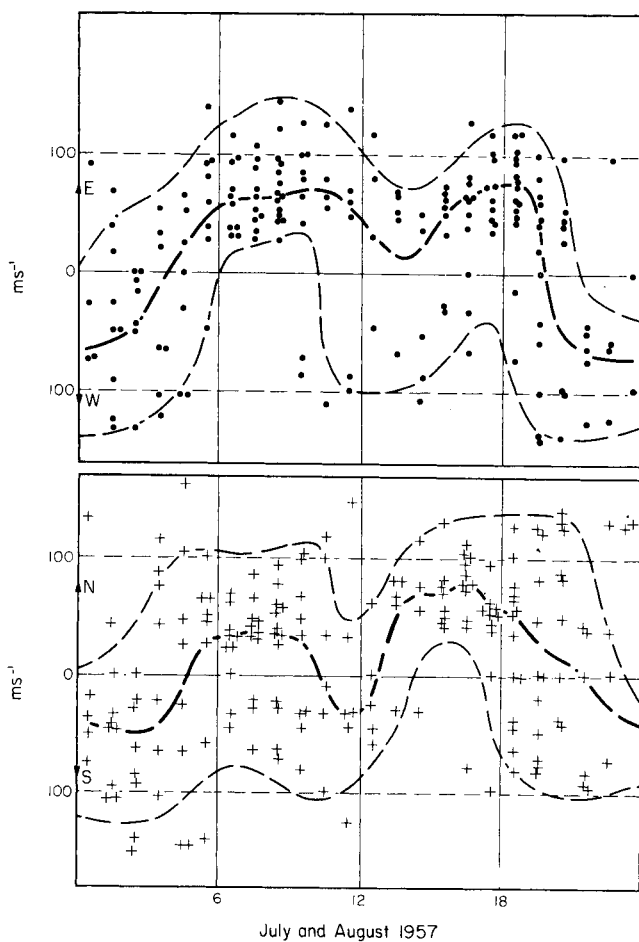


FIG. 1. The hourly values of the E-W and N-S drift components at Kjeller during July and August 1957.

TABLE 1. Summer values

			a	c_1	c_2	ϵ_1	ϵ_2
			m/sec	m/sec	m/sec	degr.	degr.
v'_x (E-W)	Kjeller	1954-55	21	68	38	- 95	-103
v'_x (E-W)	Kjeller	1957-58	14	51	39	-108	- 82
Mean:			17	60	38	-101	- 92
v'_y (N-S)	Kjeller	1954-55	15	15	18	- 90	- 45
v'_y (N-S)	Kjeller	1957-58	7	43	41	-121	- 79
Mean:			11	29	30	-105	- 62

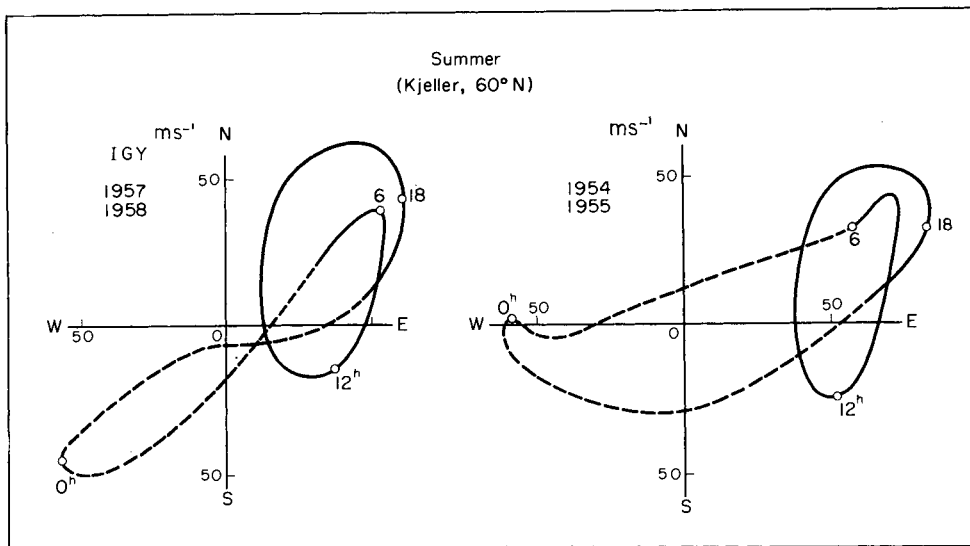


FIG. 2. The wind vector diagrams at Kjeller in summer during two-periods of observation. The continuous curve indicates the part of the day when the *normal E*-layer is present and a semi-diurnal period is present. The broken part of the curve indicates night-time conditions when only reflections from an *Es*-layer are present, the wind vector is in this case directed towards SW.

The wind vector diagrams for autumn, winter and spring are given in Fig. 3.

The semi-diurnal period, appearing as a double circle, is broken at night from 20 h to 5 h, during the summer season only. At night time when *Es* is present, the drift is mainly towards SW.

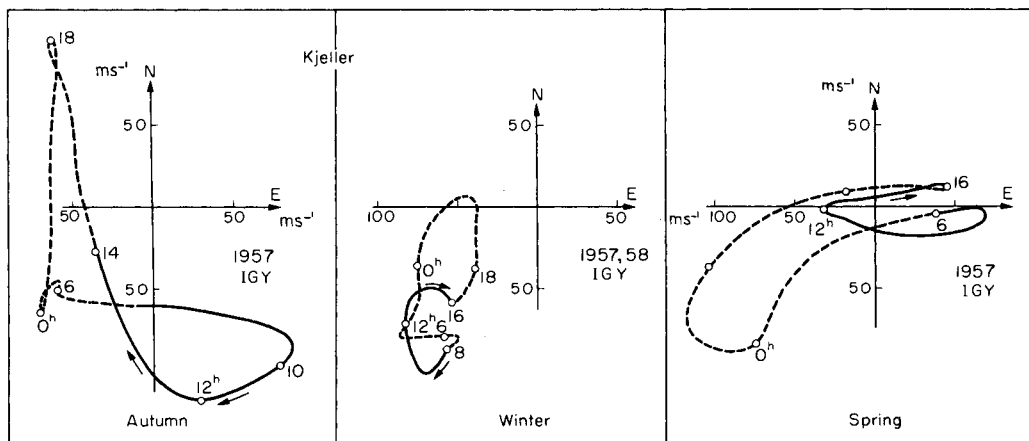


FIG. 3. Wind vector diagrams at Kjeller in the IGY during autumn, winter, and spring. The continuous curve indicates the part of the day when the *normal E*-layer is present.

The same general feature, although less distinct, is repeated in the diagrams for the three seasons of autumn, winter, and spring. We notice that during all the four seasons the rotation of the wind-vector *during day-time* is in the same direction. We also notice that the day part of the vector diagram is more regular than the night part when E_s has been recorded.

Looking at the wind vector diagrams in Figs. 2 to 3, it is apparent that the drifts consist of three parts:

- (a) a *day-part* which consists of a semi-diurnal variation, appearing as a double closed circle only broken at night time when E_s has been recorded.
- (b) a *night-part* when E_s has been recorded, the drifts are here mainly directed towards SW.
- (c) a *regular and prevailing* drift in day-time, represented by a vector from origo to the centre of the semi-diurnal circle.

This vector which represents the prevailing drift of the normal E during day-time, changes its direction during the seasons.

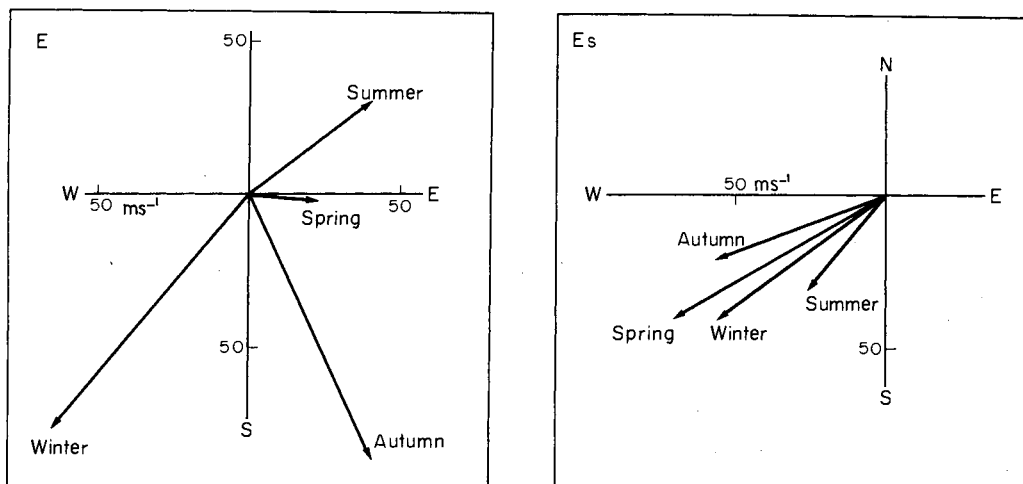


FIG. 4. The prevailing drift directions during the seasons of normal E (at day-time) and E_s (at night-time) at Kjeller.

The prevailing drift directions of the normal E and the E_s are illustrated in Fig. 4. The vectors indicating the drift of the normal E represent the distance from origo to the centre of the circle giving the semi-diurnal variation indicated in Fig. 3. The vector indicating the prevailing drift of E_s represents the vector from origo to the mean drift directions appearing at night-time.

2. Place of observation: Tromsø 69°40' N, 18°57' E.

Methods of observation and recording: similar equipment to that at Kjeller.

Presentation of the Results

The Tromsø station, which lies close to the auroral zone, is strongly disturbed and the character of the fadings is more irregular and rapid than at stations in middle and low latitudes. Recording equipment similar to that in operation at Kjeller was in use at Tromsø during the IGY, but the irregular character of the fadings made the application of the Phillips recorder difficult. It soon turned out that the diffraction pattern at Tromsø is usually highly anisometric, and an analysis of the material showed that it is not possible to present values of the drift components according to the simple scheme in use at stations in middle and lower latitudes. *E*-echoes which can be characterized as being reflected from the *normal E*-layer appear only in a small number of cases, the echoes usu-

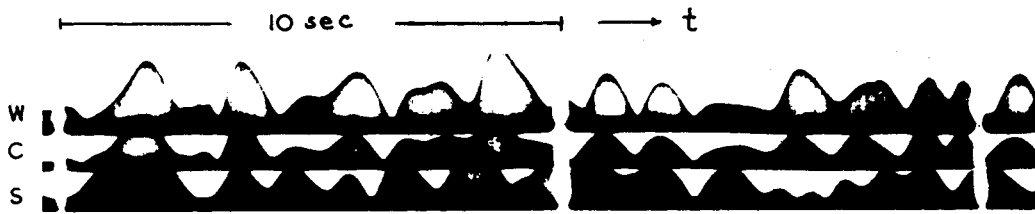


FIG. 5. Records of amplitudes of *Es*-echoes over the E-W and N-S bases at Tromsø. There is high correlation between the amplitude at the receiving points in E-W direction and a low correlation between the receiving points in N-S direction.

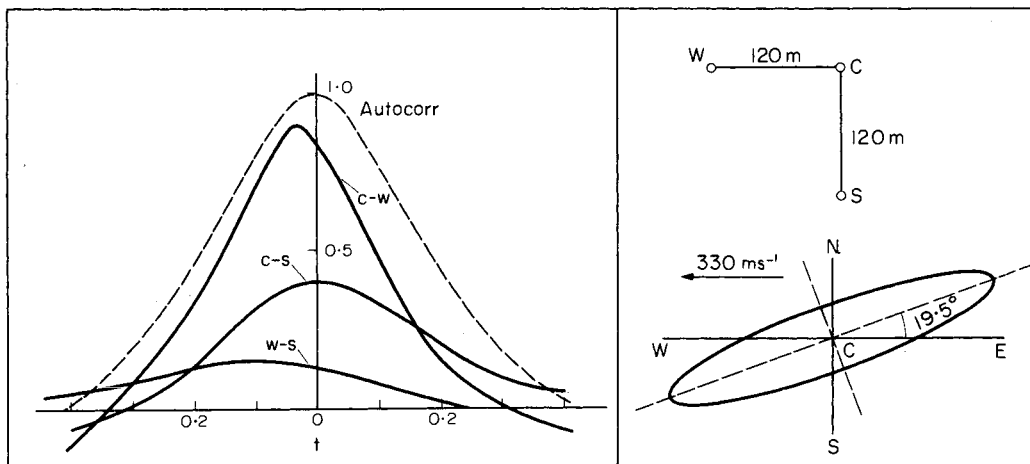


FIG. 6. Auto-correlation and cross-correlation functions from the sample in Fig. 5. The position of the ellipse of constant correlation in the diffraction pattern is indicated.

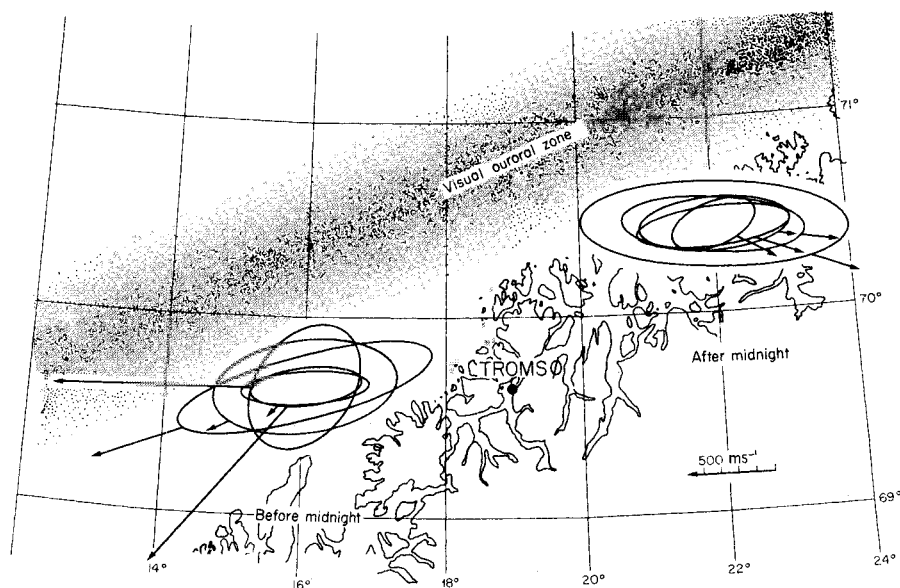


FIG. 7. Examples of correlation ellipses and drift velocities of the *Es* pattern observed at Tromsø (after MAEHLUM³).

ally appearing are *Es* of various types. It seems doubtful whether it is possible to obtain sufficient material for presenting drift effects of the *normal-E*-layer at a highly disturbed place like Tromsø.

The anisotropy of the *Es*-diffraction pattern made it necessary to use a full correlation analysis in order to obtain results of any interest. In the late part of the IGY period a series of amplitude recordings with a 3-beam oscillograph was therefore taken and a number of full analyses of the *Es*-drift were carried out. As a result of the drift studies made at Tromsø during the IGY the analysis of the anisotropy and drift of the *Es* will be presented.

The period of fading of echoes from the normal *E*-layer at Kjeller is of the order of 8 Hz. At Tromsø the period of fading was shorter, and during disturbances when *Es* appeared, which happened during most of the time, a fading period of about 1 Hz was frequently observed. During the phase of the positive polar geomagnetic storm, occurring at Tromsø at about 18 h, *Es*-echoes with a fairly regular fading period of about 1 Hz very often appeared. During stronger disturbances at night, the period of fading rapidly increased. These 1-s fadings of the *Es* could easily be photographed on a multibeam oscilloscope using a moving film, and a number of samples were taken during the winter 1957–58. The most remarkable feature of these fadings was the strong correlation between the fadings from the aerials in E–W direction and the low correlation between the fadings from aerials in N–S direction. This indicates that in the diffraction pattern there were “ridges” lying in E–W direction.

From a number of samples obtained, most of them recorded during the afternoon hours 17h–20h CET under conditions of moderate positive geomagnetic storms, similar

characteristics of the correlation were stated. In the example analysed the diffraction pattern on the ground was strongly elongated in E—W direction, and the “ridges” seemed to lie approximately parallel to the current system, which is responsible for the geomagnetic disturbances, and parallel to the auroral zone.

The analysis of the diffraction pattern of *Es* at Tromsö by correlation methods has been taken up by MAEHLUM³. He states that the drifts are mostly in E—W directions and drift velocities up to 1600 m/sec were estimated.

There is a significant change in the drift direction of the *Es* before and after midnight. Before midnight (during the phase of the “positive” geomagnetic disturbance) the drift is toward the west, after midnight (during the phase of the “negative” geomagnetic disturbance) the drift is directed towards the east. This change in drift direction of the *Es* corresponds to a similar change in the direction of the current systems producing the geomagnetic disturbances and also in the direction of movement of the visual auroral forms.

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4.7. DRIFT OBSERVATIONS DURING THE IGY AT HALLEY BAY

W. H. BELLCHAMBERS and W. R. PIGGOTT*

DURING 1957, the drift measurements were severely restricted by high absorption, site noise and spread echoes, but, in January 1958, the sensitivity was raised considerably by installing larger loop aerials. The last few months of 1958 were also remarkably quiet ionospherically, which greatly increased the number of successful observations obtained.

Relatively few *E*-region observations were obtained in winter when the normal *E*-layer was not present. Successful *F*-region observations were rare between midnight and about 08.00 UT, since severe scatter was usually present for more than half the days in this period. Out of 190 days on which diurnal sequences of observations were attempted in 1958, only 24 gave usable observations for 16 or more hours per day while 81 gave usable observations for 8 or more hours per day.

At Halley Bay, the fading patterns could change fundamentally in about 15 min; hence, even when it was impossible to obtain a numerical drift measurement in one 5-min period, it was sometimes possible 5 minutes later. During the last six months of the IGY, the period of recording was extended beyond 10 min to take advantage of this fact.

Successful drift measurement at Halley Bay requires higher speeds for the paper, longer records and probably closer aerial spacing than is normal at lower latitudes. It is doubtful whether the automatic methods, such as that due to PHILLIPS¹, could be used successfully in the presence of the high noise level and the rapid changes in echo pattern found at Halley Bay.

It is known that, if the radio diffraction pattern on the ground is not statistically circular, the simple method of calculation can be in error; it is then desirable to use a more elaborate method. The full correlation analysis was applied, therefore, to a limited number of records in order to assess the veracity of the assumptions made in using the simple method.

The full analysis showed that, on the average, the ellipses of constant correlation were oriented with their major axes roughly along the magnetic meridian and that the axis ratio was about 1.8. The major and minor axes for a correlation of 0.5 were about 330 and 180 m, respectively. The mean speed found for the seven samples, 115 m/sec, does not differ significantly from that given by the simple analysis, 101 m/sec. Although the individual speeds differed by three to one, they were quite uncorrelated. It is clear that the individual measurements of speed were critically dependent on the method of analysis used.

The mean and individual values of the directions found by the two methods agreed very well. Three pairs of directions agreed within 1°, three deviated away from the meridian as expected and one deviated towards it. Thus the direction of drift could be found with considerable accuracy, the standard deviation of the departures being only 13°.

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If the most probable corrected directions, Φ , can be estimated from the observed values, Φ' by using the mean axis ratio and mean direction of elongation, the observed values of Φ' can be converted to Φ using Table 1. The assumption is only justified when forming averages of groups of data. The data in Tables 2 and 3 have been calculated in this way assuming an elongation of 1.8; the corresponding amplitudes, v were found by assuming that $v = v' \sec (\Phi' - \Phi)$.

1. E-region Drift

During 1958, the number of successful measurements of drift velocity varied from an average of 20 per month for the relatively disturbed months, February to July, to almost 200 in the abnormally quiet month of November. The disparity is enormous. It is concluded that the data are greatly biased in favour of quiet conditions.

The relative frequency of occurrence of either high or low speeds at different levels of magnetic activity confirms this conclusion. Table 4 shows, for three different ranges of the quarter-hourly magnetic index, Q , the percentage of occasions during December 1958 on which the drift speeds were less than 8.5 m/sec, between 8.5 and 170 m/sec, and greater than 170 m/sec. It is clear that large velocities were more frequently observed during disturbed periods.

Seasonal changes in the drift velocity were estimated by calculating the median values of the components of velocity for each hour, and evaluating the medians of these median values for each individual month. The direction, Φ' of the resultant velocity vector is shown in Fig. 1. The most probable speeds found were near 80 m/sec for the autumn and winter, and near 60 m/sec for spring and summer.

The percentage of occasions in which the drift was in a particular direction are shown as polar histograms for the four seasons in Fig. 2.

These results are based on calculations made by the simple method, which assumes the radio diffraction pattern at the ground to be statistically circular. If allowance is made for a statistical elongation, with an axis ratio of 1.8 along the meridian, the N-S

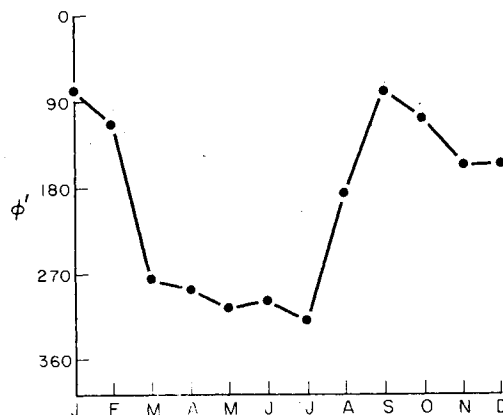


FIG. 1.

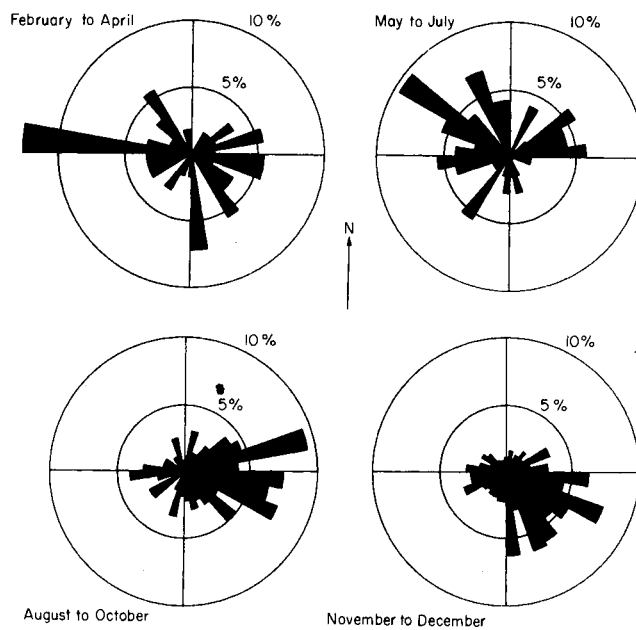


FIG. 2.

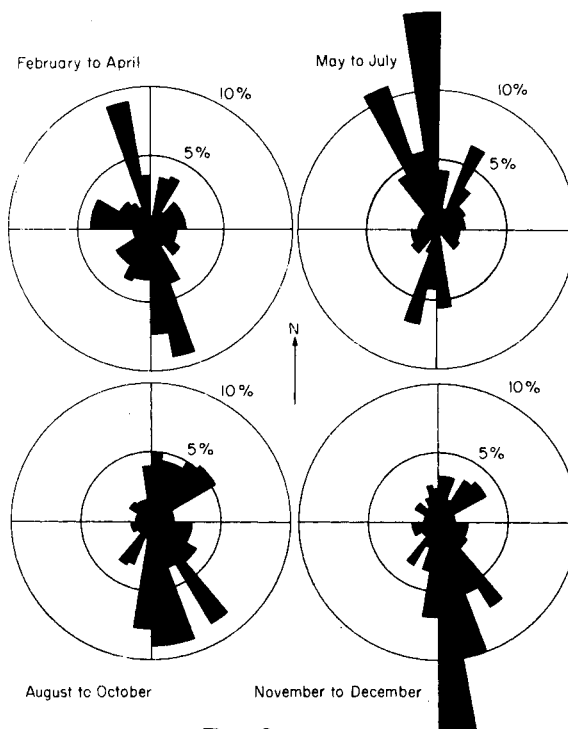


FIG. 3.

components of velocity will be greatly increased, thereby inclining the vectors in these directions. The results of a recalculation, in which an allowance has been made for this tendency, are shown as the polar histograms in Fig. 3.

The diurnal variation of the direction, Φ' , does not show clear evidence of any semi-diurnal rotation such as observed in the northern hemisphere². However, such variations can be detected in the data for certain individual months. The direction of rotation is then anticlockwise, the reverse of that found in the northern hemisphere.

2. F-region Drift

It was not possible to make satisfactory determinations of the *F*-region drift velocities either during disturbed periods, when the fading was too rapid, or when the operating frequencies were reflected from the normal, or the sporadic *E*-layer. Despite these limitations, successful determinations were made more frequently than for the *E*-region. The results given by the simple method of analysis are presented in Figs. 4 and 5, in a manner similar to that used for the *E*-region results. (Figs. 1 and 2).

The percentage distribution of speeds, v' , for the year as a whole (Fig. 6) is similar to that found in each season and shows a peak near 80 m/sec.

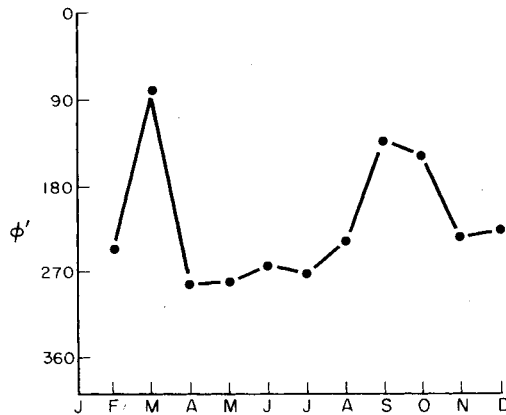


FIG. 4.

An analysis of the times of maximum drift velocity towards the four cardinal points for all months shows well marked peaks. These occur at the following hours:

	UT	LMT
north $+ v'_y$	0300	0100
east $+ v'_x$	0800	0600
south $- v'_y$	1300	1100
west $- v'_x$	0000	2200

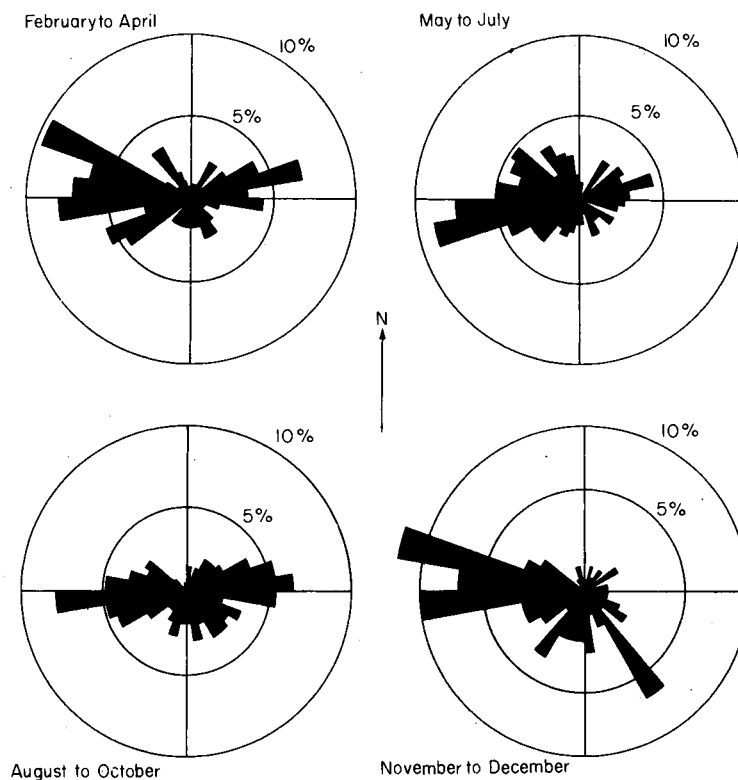


FIG. 5.

Therefore, it is probable that the diurnal component of velocity contains a clockwise rotating vector throughout the year.

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TABLE 1. Relation between Φ' (similar fades) and Φ (full analysis)

Φ'	Φ	Φ'	Φ	Φ'	Φ	Φ'	Φ
Degrees							
0	0	90	90	180	180	270	270
15	5	105	131	195	185	285	311
30	10	120	152	210	190	300	332
45	17	135	163	225	197	315	343
60	28	150	170	240	208	330	350
75	49	165	175	255	229	345	355

TABLE 2. *E*-region drift velocities: Three-hourly running median values of v'_x , v'_y , v' , Φ' and v , Φ for the four seasons of 1958

season	hour UT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
autumn Feb.-April	parameter																								
	$v'_x(E)$	-84	-83	-84	-87	+40	+166	+86	+50	+79	+73	+72	+54	+45	+30	+30	+30	+8	+35	+37	+92	+53	-138	-158	-139
	$v'_y(N)$	+2	+19	+12	+12	+39	+28	+68	+38	+48	-1	-14	-32	+19	+44	-3	+104	-3	-30	-44	-32	-32	+2	+23	+2
	v'	84	85	85	88	56	168	110	63	92	73	73	63	49	53	30	103	9	46	58	97	62	138	160	139
	Φ'	271	283	278	278	46	80	52	53	59	91	101	127	67	34	96	16	111	134	150	109	121	271	278	271
winter May-July	count	6	9	9	5	2	3	4	6	7	10	9	11	9	9	5	5	7	10	11	7	5	5	5	5
	v	84	92	89	91	63	178	128	74	108	74	78	67	57	57	31	111	9	52	61	105	62	138	167	139
	Φ	274	306	294	294	18	61	21	22	27	95	122	142	36	12	109	5	142	162	170	138	152	274	294	274
	$v'_x(E)$	-126	-92	-116	-43	-30	+69	-70	-70	-123	+351	-34	-38	-49	-50	-64	-67	-59	+7	+9	-13	-35	-86	-86	-117
	$v'_y(N)$	+85	+54	+25	+56	+56	+60	+41	+27	+17	+131	+82	+82	+15	+15	+19	+44	+31	+24	+34	+39	+37	-32	-32	+92
spring Aug.-Oct.	v'	152	106	119	71	64	91	81	75	124	375	90	90	51	52	67	80	67	25	35	41	51	92	92	149
	Φ'	304	300	282	322	332	49	300	291	278	70	337	335	287	287	303	287	298	16	15	342	317	250	250	312
	count	6	7	10	16	16	14	9	7	3	2	5	5	7	7	12	11	11	10	12	12	11	10	6	7
	v	179	124	129	78	67	105	96	87	129	429	108	108	58	59	75	83	78	26	36	42	57	106	106	170
	Φ	336	331	305	346	350	19	332	321	294	41	353	352	314	314	314	334	329	5	4	354	344	220	220	341
summer Nov.-Dec.	$v'_x(E)$	-172	+37	-18	+57	+12	+28	+41	+59	+42	+62	+60	+64	+61	+61	+50	+46	+38	+41	+56	+56	+50	-136	-164	-172
	$v'_y(N)$	-53	+118	+186	+84	+67	+58	+62	-18	-25	-19	-10	-2	-2	0	+2	+4	-13	-20	-31	-22	-27	-42	-58	-73
	v'	180	124	187	86	68	64	74	62	67	65	61	64	61	61	50	46	40	46	64	60	57	142	174	187
	Φ'	253	17	354	42	10	26	33	107	112	107	99	92	92	90	88	85	109	116	119	111	118	253	251	247
	count	7	6	9	8	11	13	11	10	19	32	45	46	46	51	52	47	44	54	33	22	16	9	9	3
summer Nov.-Dec.	v	203	127	188	97	69	67	79	70	69	73	65	65	61	61	50	47	46	54	75	70	67	160	198	232
	Φ	225	5	358	15	3	9	12	135	125	135	118	98	98	90	85	75	138	148	151	142	150	226	222	214
	$v'_x(E)$	-41	-41	-38	-23	+24	+29	+28	+7	+24	+33	+38	+38	+29	+23	+21	+18	+23	+28	+39	+50	+54	+59	+56	+46
	$v'_y(N)$	-1	+10	+4	0	-31	-40	-47	-54	-39	-19	-18	-25	-31	-28	-18	-20	-22	-34	-37	-34	-26	-10	-8	-2
	v'	41	42	38	23	39	49	63	54	46	39	42	38	39	35	26	34	36	52	62	64	64	57	47	26
summer Nov.-Dec.	Φ'	269	284	276	270	142	144	154	173	148	120	115	131	143	143	135	126	128	131	126	122	114	100	100	266
	count	45	46	42	43	47	51	50	51	57	52	47	42	41	52	50	47	38	36	43	44	50	46	44	39
	v	41	46	39	24	43	53	66	55	46	46	49	43	43	38	29	40	42	60	72	76	75	60	50	26
	Φ	267	309	289	270	166	167	171	178	169	152	147	160	167	167	163	157	158	161	157	154	145	119	119	258

TABLE 3. *F*-region drift velocities: Three-hourly running median values of v'_x v'_y v'_z , Φ' and v , Φ for the four seasons of 1958

season	hour UT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
autumn Feb.-April	parameter																								
	$v'_x(E)$	-30	-30	-33	-29	+2	+49	+49	+53	+3	+57	+23	+35	+12	-2	-17	-17	-76	-52	-78	-78	-102	-109	-64	+24
	$v'_y(N)$	-17	-19	+10	+6	+6	+2	-1	-5	-8	-5	-48	-50	-56	+6	+21	+20	+21	+15	+9	+12	+16	+22	+16	+59
	v'_z	32	30	33	30	6	49	49	53	8	57	53	61	57	6	27	26	79	54	78	79	103	111	66	63
	Φ'	240	238	253	282	18	88	91	95	159	95	154	145	168	342	320	320	285	286	277	279	279	281	284	22
	count	12	12	12	11	12	12	12	9	8	8	9	9	9	10	9	11	14	21	30	31	32	24	20	14
	v	40	42	39	33	6	49	49	54	5	58	56	66	58	6	30	29	87	61	81	83	108	119	73	65
	Φ	208	206	226	305	6	85	94	107	173	107	171	167	176	354	346	345	512	313	292	297	297	302	309	7
	$v'_x(E)$	-145	-97	-74	+156	+69	+120	-28	+67	+72	-27	-13	-32	-26	-35	-31	-42	-35	-54	-66	-82	-85	-82	-109	-109
	$v'_y(N)$	-5	+24	+29	+69	+15	+10	+10	-4	+23	-7	0	-8	+6	0	0	+12	+17	+14	+8	-9	-14	-36	-31	-22
winter May-July	v'_z	145	100	80	171	71	120	30	67	76	28	13	33	27	35	31	44	39	56	66	82	86	90	113	111
	Φ'	268	284	291	66	78	85	290	93	72	255	270	256	283	270	270	286	296	285	277	264	261	246	255	258
	count	9	7	8	11	14	14	12	10	10	18	24	36	44	55	59	64	75	78	76	60	48	32	21	13
	v	146	110	92	199	77	122	35	68	86	31	13	36	26	35	31	49	45	62	68	84	90	105	126	121
	Φ	263	309	321	35	55	75	320	100	44	229	270	231	307	270	313	327	311	292	251	243	243	215	229	235
	$v'_x(E)$	-42	-58	0	+34	+43	+56	+64	+77	+83	+78	+28	+21	+32	+16	+50	+13	+29	-25	-27	-30	-30	-31	+3	-42
	$v'_y(N)$	-17	-12	-10	+10	+18	+10	0	-3	-7	-13	-52	-24	-26	-19	-3	0	-26	-28	-14	-27	-16	-18	-17	
	v'_z	44	59	10	85	47	57	64	77	83	79	59	82	41	25	50	13	29	36	39	33	40	35	13	44
	Φ'	247	258	180	74	67	80	90	92	95	99	152	139	129	140	93	90	224	224	224	245	228	243	171	243
	count	45	34	37	41	48	49	44	43	39	31	27	27	30	30	28	28	32	30	49	54	61	61	50	50
	v	51	63	10	39	55	60	64	77	85	63	62	36	47	28	50	13	29	40	44	39	46	41	18	51
spring Aug.-Oct.	Φ	216	235	180	47	36	61	90	97	106	117	170	165	159	165	100	90	197	197	214	199	212	177	218	
	$v'_x(E)$	-94	-92	-90	-67	-3	+6	+3	-38	-37	-40	-63	-16	+43	+31	+21	-27	+5	+5	+11	+2	-10	-69	-99	-98
	$v'_y(N)$	+1	-5	0	-2	+22	-2	-30	-56	-48	-56	-22	-1	-61	-59	-92	-60	-61	-58	-61	-53	+4	+13	+15	+10
	v'_z	271	267	270	268	352	108	171	214	218	215	251	266	145	152	167	204	175	175	170	178	292	281	279	276
	Φ'	179	183	180	181	98	342	280	236	232	234	199	184	305	350	283	246	275	275	290	272	158	169	123	174
	count	24	25	12	22	17	15	13	15	18	15	13	10	16	14	13	9	9	11	15	19	17	18	20	25
	v	94	93	90	67	22	7	30	73	63	72	77	18	81	70	95	69	61	58	62	53	13	75	105	101
	Φ	273	257	270	263	357	137	177	192	199	197	222	257	167	170	188	178	178	177	179	322	302	302	289	
	$v'_x(E)$	-94	-92	-90	-67	-3	+6	+3	-38	-37	-40	-63	-16	+43	+31	+21	-27	+5	+5	+11	+2	-10	-69	-99	-98
summer Nov.-Dec.	$v'_y(N)$	+1	-5	0	-2	+22	-2	-30	-56	-48	-56	-22	-1	-61	-59	-92	-60	-61	-58	-61	-53	+4	+13	+15	+10
	v'_z	271	267	270	268	352	108	171	214	218	215	251	266	145	152	167	204	175	175	170	178	292	281	279	276
	Φ'	179	183	180	181	98	342	280	236	232	234	199	184	305	350	283	246	275	275	290	272	158	169	123	174
	count	24	25	12	22	17	15	13	15	18	15	13	10	16	14	13	9	9	11	15	19	17	18	20	25
	v	94	93	90	67	22	7	30	73	63	72	77	18	81	70	95	69	61	58	62	53	13	75	105	101
	Φ	273	257	270	263	357	137	177	192	199	197	222	257	167	170	188	178	178	177	179	322	302	302	289	

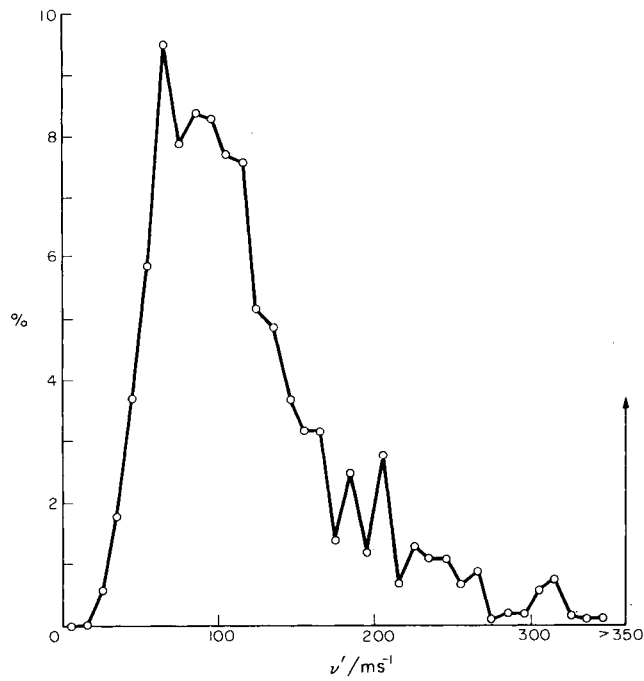


FIG. 6.

TABLE 4. E-region drift speeds and magnetic activity index Q .

Q	v' (m/s)			Median v'	Number of observations
	<85	85 to 170	>170		
	%	%	%	m/s	
0-1	84	9	7	65	75
2-3	63	27	10	75	79
4-5	46	31	23	80	13

4.8. IONOSPHERIC DRIFTS MEASURED BY THE RADIO STAR SCINTILLATION TECHNIQUE

H. J. A. CHIVERS.*

DURING the IGY, regular drift observations were made on 80 MHz from Jodrell Bank with three stations spaced by about 1 km. The Cygnus (19N4A) radio source was observed for at least several days each month when near lower culmination. Scintillation of the source was always present for a period of about 5 h centered on lower culmination regardless of the time of day at which the observations had to be made¹. Thus the situation was different from that in the 1954 measurements when the source was observed at high elevations only and scintillations were only present at night.

In the course of the 18 months of the IGY, 627 determinations of drift motion were made. The drift directions are plotted in histogram form in Fig. 1 where the angles refer to the direction which the irregularities were approaching. It can be seen that most of the directions measured came within the range of directions expected assuming the

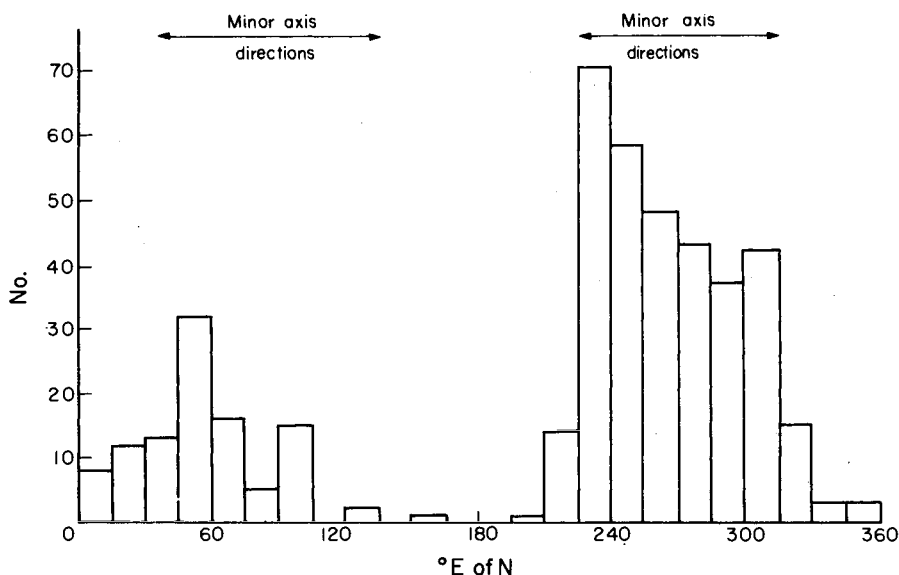


FIG. 1.

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irregularities are elongated along the magnetic field direction². The drift speeds measured are shown in Fig. 2. The values observed ranged from 50 to 3700 m/sec and it can be seen from the histogram that the most common speed was between 200 and 300 m/sec.

To examine the "reversal" problem, the percentage of westerly drifts for each hour of the average solar day has been determined. In order to weight the percentages obtained according to the number of determinations in each hour, a 4h- weighted running mean has been determined and is shown by the solid line in Fig. 3(a). It can be seen that near 1800 UT, 96 per cent of the measured drifts were in a westerly direction, and that this value falls steadily to reach a minimum of 42 per cent at 03.00 UT. On this evidence, drifts would be in a westerly direction almost every day and there would be just over a 50 per cent probability of a reversal in direction occurring during the night hours.

During actual observing periods, which usually lasted for several hours, sudden reversals were sometimes recorded, but these were few compared with the total number of vectors measured. Accordingly, to examine the diurnal distribution of reversals the diurnal distribution of westerly vectors has been used in the following way. A smooth curve has been fitted to the experimental points by harmonic analysis, and if y is the percentage of westerly drifts, and t is the time in hours, the equation obtained can be written:

$$y = 74.5 - 19.0 \sin 15^\circ(t/h + 0.5) - 6.0 \sin 30^\circ(t/h + 0.07) + 3.0 \sin 45^\circ(t/h + 2.0)$$

including terms to the third harmonic only. Since the amplitude of the third harmonic curve is about the same as the probable error in the experimental value of y , it is not considered significant. The calculated points using terms to the second harmonic are

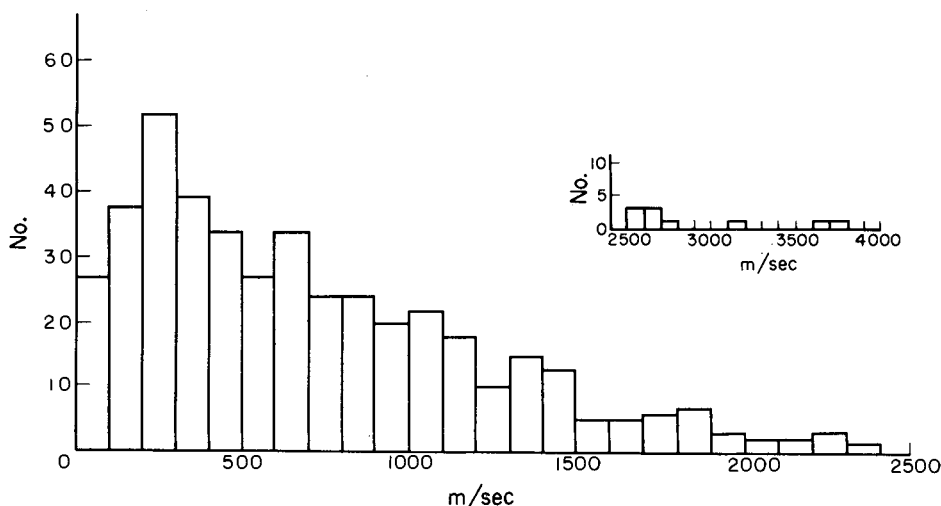


FIG. 2.

plotted in Fig. 3(a) and are connected by the dashed line. Since the best estimate of the most probable time for the occurrence of a reversal is the time at which this curve has the greatest slope, its first differential has been derived and is reproduced in Fig. 3(b). The

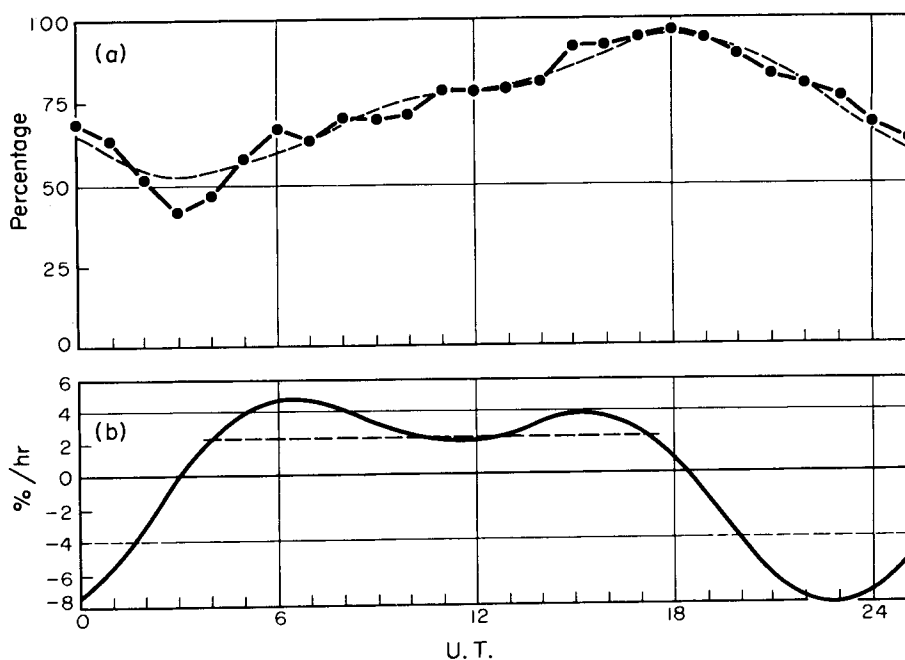


FIG. 3.

differential has a distinct negative value at 23.00 h but the two positive maxima are not so distinctive. It can be seen that the half amplitude width of the negative excursion is 6 h while that of the positive excursion is 14 h. The interpretation of this curve is that the most probable time for the observation of a reversal from westerly to easterly drifting is near 23.00 h but that there is no definite time for the occurrence of the complementary reversal.

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4.9. SEASONAL AND LATITUDE VARIATIONS OF NOON BEARINGS OF E-REGION DRIFTS

L. HENDERSON,*

BRIGGS and SPENCER¹ have compared noon values of the E-W component of E region drift velocity at Cambridge and Wellington (Lower Hutt). The seasonal variation averaged over four years at Cambridge was sinusoidal, being towards the east in summer and the west in winter. Only eight months' data were then available from Lower Hutt, and they confirmed that at least in summer the two hemispheres had strong components to the east in middle latitudes. BRIGGS and SPENCER drew the then reasonable deduction that the seasonal variation was the same at both stations.

Examination of further Lower Hutt noon data shows that the E-W component does not have a simple sinusoidal variation with season. In fact, during six years of observations covering the extreme range of solar activity (1952-58), it has shown a consistent trend to the east in both winter and summer, and to the west in the equinoxes. We note that the Cambridge curves for early afternoon (Fig. 11 of BRIGGS and SPENCER,¹) show a similar trend, although the annual cycle mentioned above predominates near noon.

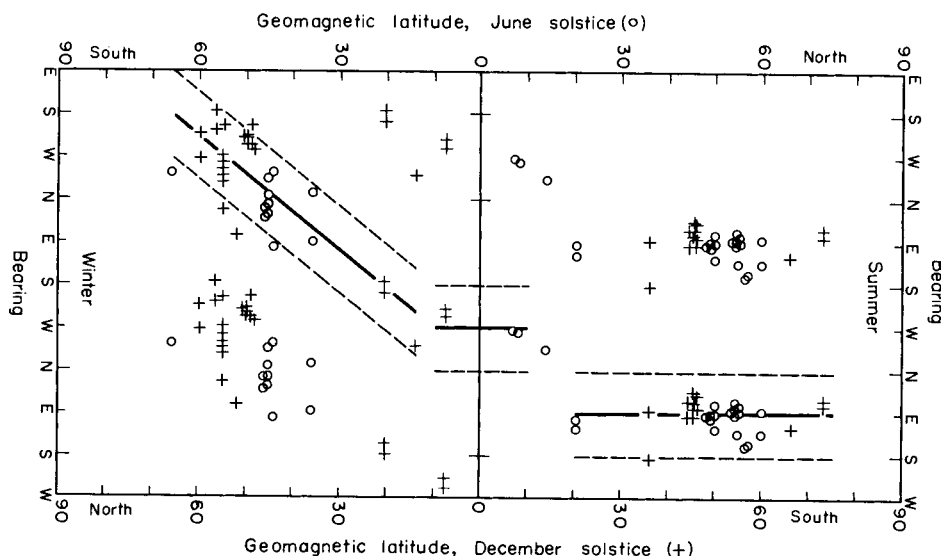


FIG. 1. Variation of E-region noon bearings with geomagnetic latitude. o data for June solstice (left ordinate); + data for December solstice (right ordinate). Note: the bearings scale covers a range of more than two cycles, so that each point is plotted at least twice.

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In the simple MITRA² method of deriving drift velocities, it is well known (e. g. YERG³), that the speeds are seriously overestimated when random motions form a significant part of the drift velocity. Although most of the affected data have been eliminated by inspection, it is thought that some of the residual scatter in E-W components may be due to this effect. For the purpose of this note, attention is confined to a study of drift bearings, which appear to be more precisely defined.⁴

A seasonal plot of bearings at Cambridge and Wellington confirmed the common trend to the east in summer and the different behaviour in winter. Results from some other stations suggested that there might be a latitude effect in winter. This hypothesis has been tested by examining average summer and winter noon bearings derived from all published data, together with some provided by private communication. These data were plotted against geographic, geomagnetic and dip latitudes. The summer plots were very similar in all three cases. For the winter results, the spread of bearings versus geographic latitude was such that no mean trend could readily be discerned. However, the distributions versus geomagnetic and dip latitudes showed significantly less spread, and both varied in a similar manner. It was thus apparent that some magnetic latitude control was present, but on the available data there was no clear discrimination between the

TABLE 1. List of drift stations and the period of observations for data shown in Fig. 1.

Station	Geomag. Lat (°)	Year	No. of points		Source of data
			Sum	Wint.	
Kjeller	N 60	1953-5	2	2	HARANG and PEDERSEN ⁵
Jodrell Bank	N 56½	1953-5	2	2	GREENHOW and NEUFELD ^{6,7}
Cambridge	N 55	1949-58	7	7	BRIGGS and SPENCER ¹ BRIGGS†
State College	N 52	1951-2	0	1	MILLMAN ⁸
Freiburg	N 50*	1955-9	3	5	HARNISCHMACHER and RAWER ^{9,10} RAWER†
Washington	N 49*	1950-3	3	3	SALZBERG and GREENSTONE ¹¹ BRIGGS and SPENCER ¹
Yamagawa	N 20½	1957-8	2	2	TSUKAMOTO and OGATA ¹² SHIMAZAKI ¹³
Ahmedabad	N 14	1956-7	1	1	SETHURAMAN ¹⁴
Waltair	N 7½	1957-8	2	2	RAO and RAO ^{15,16}
Brisbane	S 36	1952-4	2	2	BURKE and JENKINSON ¹⁷
Adelaide	S 44½*	1952-4	2	2	ELFORD ¹⁸
Wellington	S 45½	1952-8	6	6	
Halley Bay	S 66	1958	1	1	BELLCHAMBERS and PIGGOTT ¹⁹
Mawson	S 73	1957-9	2	0	ELFORD and MURRAY ²⁰

* Values adjusted by about half a degree so that data from different stations can be distinguished in Fig. 1.

† Data provided by private communication.

local and the dipole field effects. Fig. 1 shows the distribution of noon bearings in summer and winter versus geomagnetic latitude. The observing stations and sources of data are listed in Table 1.

In the case of observations by the meteor trails method (Adelaide, Jodrell Bank, Mawson), the bearings were derived from the published Fourier series. Where these were given for several height ranges only the upper region, centred on 100 km, was used.

Figure 1 has been so drawn that observations for both hemispheres are superimposed according to season, but have separate symbols. Each point represents the average bearing for one season, the years covered being as listed in Table 1. A few points are based on only one month's observations. The linked pairs of points for Yamagawa show values for the same data treated by slightly different methods (TSUKAMOTO and OGATA¹², SHIMAZAKI¹³.)

Full lines, described below, indicate the probable variation with latitude and season. Broken lines, drawn at 90° to either side, are inserted merely to facilitate estimation of the spread of data.

The major novel feature of Fig. 1 is that in *winter*, over the latitude range 14..66°, there is a steady change of bearing with latitude. The straight line fitted by the method of least squares is defined by

$$\Phi = 710^\circ - 8\lambda_m$$

where Φ is the drift bearing in degrees E of N
and λ_m is the geomagnetic latitude.

The same group of data, when plotted against magnetic dip latitude, cover a latitude range 20..60°, and the least squares line is given by

$$\Phi = 835^\circ - 11\lambda_d$$

These lines are not greatly different over middle latitudes.

The Cambridge and Wellington data suggested a possible variation of winter bearings with sunspot number, with Φ decreasing by about 25° for an increase in sunspot number of 100. However, application of this adjustment to the above group of data did not materially reduce the spread.

Other notable features of Fig. 1 are as follows:

1. The data for both hemispheres are in reasonable agreement for the two seasons;
2. The summer trend to the east holds over the geomagnetic latitude range 20..75°;
3. There is a sudden transition to the west near the subsolar point;
4. The equatorial region has a westerly drift in both summer and winter.

Acknowledgements

This work forms part of the radio research programme of the Dominion Physical Laboratory. The author is indebted to his colleagues for assistance in making the local observations and for helpful discussions. He is also indebted to Dr. B. BRIGGS and Dr. K. RAWER for kindly supplying data prior to publication.

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4.10 INTERCOMPARISON OF INSTANTANEOUS DRIFT DATA

K. RAWER

NEARLY all results presented in this volume are concerned with a period of at least one month and are presented in the form of a statistical description. In section B we have insisted that periods have been chosen of a length so that the data could be considered statistically "significant". It is, of course, not less important to look for individual values. One of the aims of drift observations during the IGY was to obtain data in such quantities that it would be reasonably possible to compare individual observations at different stations. Unfortunately this goal has not been reached. There are a few days where many stations have been observing but for most stations the number of observations is not large enough to be significant. Under these circumstances it seemed preferable to compare individual values at all observing stations during a few of the "Meteorological World Intervals"; these were periods of 10 days intended for drift observations and it is very probable that most stations made observations on at least a few of these days. Two of these intervals, viz., June 15–24 and December 12–21 1958, have been chosen because of the number of observing stations and the quality of their results. For the original graphs we used different colours, one for each day, but we were unable to find any obvious relations between the parameters measured. We therefore decided to reproduce all observed points for a given period without any distinction, except the layer from which the echo was obtained. The relevant data were taken from those existing at WDC-C1.

The data presented have all been obtained with the three-antennae fading method as introduced by KRAUTKRÄMER in 1942. According to the IGY recommendations, each point of the following figures corresponds to the median or average obtained with all fades which occurred during a period of the order of 10 min. The data are presented in polar coordinates and as a function of the hour from the indications given in the WDC material. The following table gives the stations with their geographical coordinates and the time system used. The U.S.S.R. stations probably used legal time, i.e., the next multiple of 15° in longitude. Stations are in alphabetic order on the table, but the graphs are arranged in the order of geographical latitude (see order number on the table). There are only three Southern hemisphere stations.

Whilst in principle all stations used the same method, details of the application were considerably different. This is particularly true for the frequency used. In most countries a few fixed frequencies were used, normally the frequency was chosen so that the echo was in the desired virtual height range. This means for example that *E*-region data obtained at night have often been observed on a lower frequency than the daytime data. However, this is not true everywhere because some stations used the same frequency throughout; in these cases the number of *E*-region observations is considerably lower at night. Similarly for the *F*-region data; here many of the stations which used a rather low frequency have only night data because the reflection was from the *E*-region during the day. A more sophisticated system was used at most Soviet stations, where the frequency was individually chosen so that it was in a certain ratio with the critical frequency; this is particularly important for the interpretation of *F*-region observations where f_oF2 was used as the leading parameter. Using this system the chance of having approximately constant reflection height independent on the variations of f_oF2 is improved. In order to give an idea, the range of frequencies used is indicated on each of the graphs.

It should be emphasized that night-time *E*-region data are necessarily obtained from *E*_s-echoes whilst most (but not all) of the day time data are obtained from normal *E* (at least

on frequencies below 4 MHz). If there is a relation between the occurrence of *E*s and drift data, the night time observations presented here should have a certain bias by selection after *E*s-occurrence.

The results are presented in Figs. 1-4; 1 and 2 are concerned with the June period, 3 and 4 with December 1958. Figures 1 and 3 are for *E*-region, 2 and 4 for *F*-regions echoes. It seemed important to give an idea of the variability and dispersion of drift data, just as summary papers necessarily have a tendency to insist on regularities. It is quite clear from the figures that isolated observations are not very helpful. At stations which have at least a few days of observations, dense enough in time, we may recognize some statistical regularity, particularly in respect of direction. (It is known from general considerations that the direction is more accurately defined at fading observations than is the drift amplitude.) In some locations a constant average direction appears, in others the tidal variation (from *E* through *S* to *W*) appears clearly. However, there are cases where the individual data seem to show the contrary.

It is quite clear that large irregular variations are present in the data. Some of these are probably due to experimental uncertainty. In fact the data presented are statistical medians

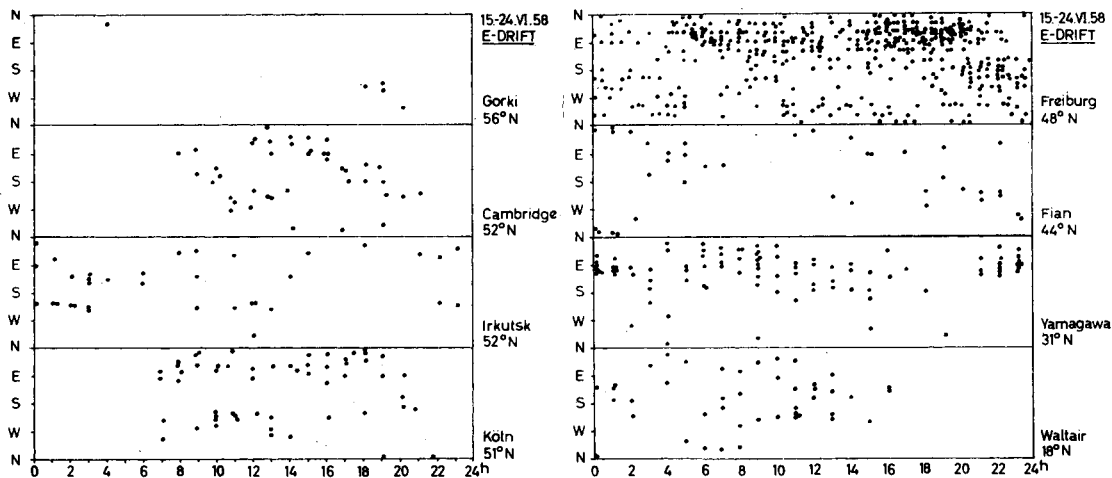


FIG. 1. June 15—24, 1958. E-Drift, direction.

or averages of a rather small number of individual fades which themselves have a large dispersion, due to the irregularity of the pattern.

On the other hand there is little doubt that important physical variations and fluctuations also occur. We should only mention here one important fact: variability of the reflection height, particularly when fixed frequencies are used. So even if the region of reflection is well defined it is not so with the specific level. As wind shears have been observed with other techniques, it is evident that changes in the ionization profile must produce equivalent changes of the height, which our techniques are sufficiently sensitive to measure. (Normally the reflection is obtained from a level where a rather steep vertical gradient exists so that the waves are seriously influenced by irregularities only at the reflection level). These height changes are partly regular (with the hour, season, etc.) partly irregular. Most of the irregularities are clearly shown by our figures.

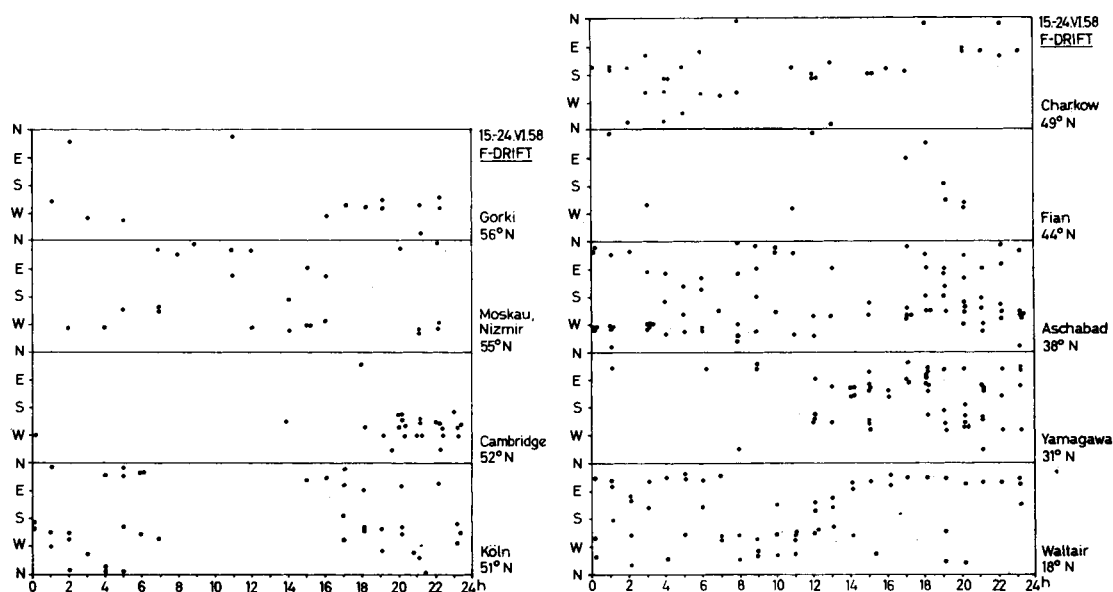


FIG. 2. June 15—24, 1958. F-Drift, direction.

The main conclusions to be drawn are the following:

1. The definition of reported regular variations depends on the statistical weight of the underlying data.
2. The total number of future observations should be considerably higher than that made by most stations during the IGY in order to obtain significant results.
3. In the future the irregular features of drift behaviour should be studied in addition to the regular ones.

Order No.	Station	Lat.	Long.	Time meridian
13	Ašhabad	37°55'N	58°18'E	
16	Brisbane	27°S	153°E	150°E
7	Cambridge	52°12'N	0°06'E	0°
9	Har'kov	49°26'N	36°55'E	
12	Fian	44°24'N	33°59'E	
10	Freiburg	48°06'N	07°48'E	15°E
3	Gor'kij	56°04'N	44°17'E	
18	Halley Bay	75°31'S	26°36'W	0°
6	Irkutsk	52°28'N	104°02'E	
8	Köln	50°56'N	6°55'E	15°E
1	Loparskaja	68°38'N	33°16,5'E	30°E
5	Moskva, NIZMIR	55°28'N	37°19'E	
4	Moskva, Leninberge	55°42'N	37°33'E	
11	Rostov	47°13'N	39°39'E	
2	Tomsk	56°28'N	84°56'E	
15	Waltair	17°43'N	83°18'E	0°
17	Wellington	41°14'S	174°55'E	172,5°
14	Yamagawa	31°12,5'N	130°37,7'E	135°E

IV. SUMMARY PAPERS

4.1 THE MAIN RESULTS OF INVESTIGATIONS OF THE IONOSPHERIC DRIFTS IN THE USSR FOR THE IGY/IGC

S. F. MIRKOTAN^{o)}

Investigations of the irregular structure of the ionosphere were undertaken in Moskva, Gor'kij, Tomsk, Har'kov, etc. At the beginning of the IGY a network of drift stations was established. From 1957 regular observations co-ordinated with the IGY program were systematically started on these stations.

This report presents the main results of the IGY/IGC observations^{††}

It is necessary to note that the analysis of the IGY/IGC material is not yet finished.

1. The Network of Ionospheric Drift Stations

Methods of Investigation

During the IGY/IGC the regular drift observations were conducted at ten stations, the list of which is given in Table 1.

The maximum spacing between the stations was 70° in longitude and 30° in latitude. The method was vertical sounding of the ionosphere with spaced reception. Each station had three spaced antennae in a triangle with dimensions of 80 to 190 m. The amplitudes of the reflected signals were recorded.^{1, 2*} Most of the reductions have been carried out using the method of similarity[†]. The Moscow (MSU) station had a measuring triangle with sides from 28 to 62 km long and recorded phase differences of the reflected signals at three points.³ In this case the drift of the large-scale irregularities was observed. The high precision of the phase method made it possible to apply the correlation method to the large-scale irregularities.^{4, 5} An electronic computing technique was applied. Since 1959 another Moscow station (IZMIRAN) has processed its data twice with two different methods: that of correlation analysis and that of similar fadings. Drifts in *E*- and *F*- layers were recorded with a small time shift every hour. Since 1960 regular observations with *Es*-echoes were begun in Ašhabad and Rostov-Don.

* These and the following references see Part I-3(d)(ix), U. S. S. R., p. 6...8.

† *Annals of the IGY*, Vol. III, Part III.

^{o)} Moscow State University, U. S. S. R.

†† The Report includes data obtained by G. G. Džemilev, N. M. Erofeev, O. Ovezgel'dyev, V. P. Perelygin (Ašhabad); Ju. V. Kušnerevskij, E. S. Zajarnaja (Moskva, Izmiran); V. D. Gusev, S. F. Mirkotan, Ju. V. Berezin, M. P. Kijanovskij (Moskva, MSU); B. I. Kaščeev, I. A. Lysenko, V. I. Taran (Har'kov); S. S. Čavdarov, V. I. Pozigun (Rostov-Don); V. D. Kokourov, E. S. Kazimirovskij, V. M. Poljakov (Irkutsk); V. V. Filatov (Murmansk) and the results of these authors which are now deposited in WDC B 2.

TABLE 1. Ionospheric drift stations in the U.S.S.R. (IGY/IGC)

No	Station	Beginning of regular observations	Layer	Parameter and distances at spacing	Main method of processing	Remarks
1	Ashabad (AN TSSR)	I. 1958	F2	Amplitude 100 × 100 m	Method of similarity	Since May 1960, the observations on <i>E</i> s have continued. The processing was carried out with the help of the correlation analysis.
2	Gor'kij (NIRFI)	VII. 1957	<i>E</i> , F2	Amplitude 140 × 140 m	ditto	
3	Irkutsk (Sib. IZMIRAN)	IV. 1958	<i>E</i> , F2	Amplitude 120 × 120 m	ditto	
4	Moskva (IZMIRAN)	VII. 1957	F2	Amplitude 160 × 190 m	ditto	Since 1959 full correlation processing is being carried out.
5	Moskva (MSU)	VII. 1957	F2	Phase changes 28-62 km	Full correlation analysis	
6	Murmansk (PGI)	XI. 1958	<i>E</i> , F2	Amplitude 115 × 130 m	Method of similarity	
7	Rostov—Don (RSU)	IX. 1958	<i>E</i> , F2	Amplitude 130 × 130 m	ditto	
8	Simeiz (FIAN SSSR)	XII. 1957	<i>E</i> , F2	Amplitude 100—200 m	Method of similarity	The observations were stopped in January 1959. During 1955—56 radioastronomy observations of drifts had been carried out.
9	Tomsk (SFTI)	IX. 1957	<i>E</i> , F2	Amplitude 100—200 m	ditto	
10	Har'kov (KhPI)	VIII. 1958	<i>E</i> , F2	Amplitude 80 × 80 m and 100 × 100 m	ditto	Additional observations of meteor trail drifts.

The frequency used for the measurements was particularly chosen for each observation according to actual ionosonde observations.

For *F*2 observations the frequency was so selected that the virtual reflection height was nearly independent of frequency (and between *f*o*F*1 and *f*o*F*2 if *F*1 was present).

The observations were carried out according to the schedule of the IGY/IGC calendar. However, during a large proportion of the recommended days the ionosphere was in a disturbed condition. For this reason only about 30 percent of the data could be processed with the simple method of similarity. In order to increase the amount of data, additional days of observation were introduced according to special instructions⁶.

At present all indicated stations, except Simeiz, continue their observations. The exchange of data takes place according to international agreements. All primary drift data, obtained during the IGY, were sent to the WDC B2, and are being prepared for publication.

Apart from the standard observations some additional investigations were carried out with specially developed equipment (airplane observations, investigations of polarization influences on drift measurements, investigation of the three-dimensional parameters of irregularities, etc.). We shall present some major results of these researches.

2. The Value and Direction of the Drift Velocity

Region E

The main results were obtained with small antennae spacing at frequencies of 2–3 MHz. In this case the value v' and direction (angle Φ') of the effective (apparent) velocity were obtained.* The distribution of v' was observed in the 10–200 m/sec range at all stations. The most probable value of v' was found to be in the 40–80 m/sec range.

In most cases this range was 60–80 m/sec. It is interesting to note the great similarity of the v' distributions for different stations especially when averaging over a long period (a year, a season).^{7, 8}

TABLE 2. Available data during the IGY/IGC

No.	Station	Total number of observations,			
		Months	Days	Processed observations, h	Method of observations
1	Ashabad	24	254	1590	(2)
2	Gor'kij	30	323	749	(2)
3	Irkutsk	18	161	650	(2)
4	Moskva (MSU)	28	113	1209	(1)
5	Moskva, (IZMIRAN)	30	285	1078	(2)
6	Murmansk	14	106	775	(2)
7	Rostov—Don	17	132	1142	(2)
8	Simeiz	11	71	542	(2)
9	Tomsk	26	221	848	(2)
10	Har'kov	29	201	1064	(2)

(1) Drift of large-scale irregularities.

(2) Drift of small-scale irregularities.

* The symbols v' , Φ' are used for the effective velocity of drift and v , Φ for the data obtained according to the correlation analysis.

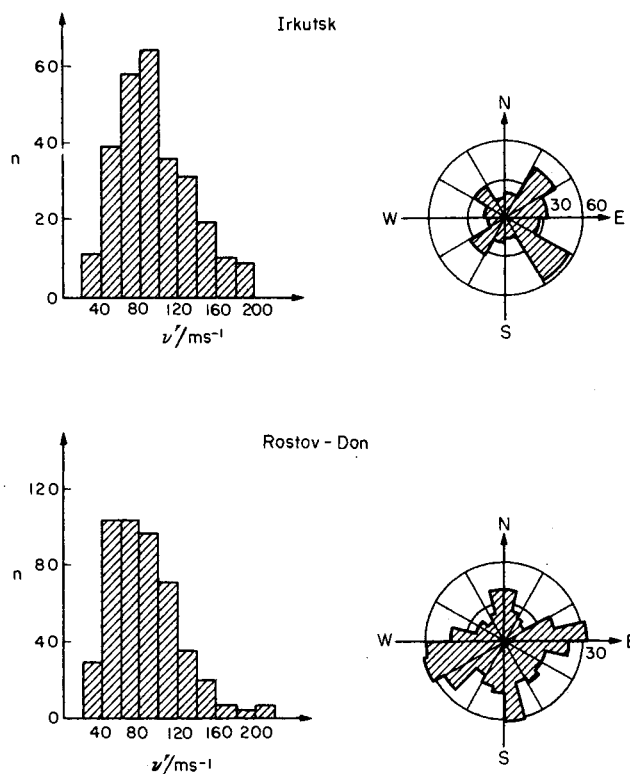


FIG. 1. Histograms of v' and Φ' for Irkutsk and Rostov-Don (1958-59) (E-layer).

In Fig. 1 distributions of v' , Φ' are given for Irkutsk and Rostov-Don.^{8, 10} At stations more to the South the smaller v' values are more frequent (Rostov-Don: 50–60 m/sec; Tomsk: 60–80 m/sec; Irkutsk: 80–100 m/sec). All stations indicate an increase of v' in the winter months. The monthly mean values of v' are given in Fig. 2. In the summer v' is of the order 65 m/sec, while it is 100 m/sec in the winter. The most probable values of v' for Irkutsk were 60–80 m/sec (in summer) and 100–120 m/sec (in winter). Comparing meteor drift observations¹¹ and ionospheric drift measurements⁹ we come to the conclusion that the relationship between the magnetic activity (K-index) and the value v' is either completely absent, or is very weak.

In Table 3 the predominant directions of the drifts for some of the USSR stations according to the IGY/IGC data are given. For comparison the data obtained at Cambridge* are also indicated.

* SHIMAZAKI, T., (1959) *Rep. Ion. Space Res. Japan* 13, 21.

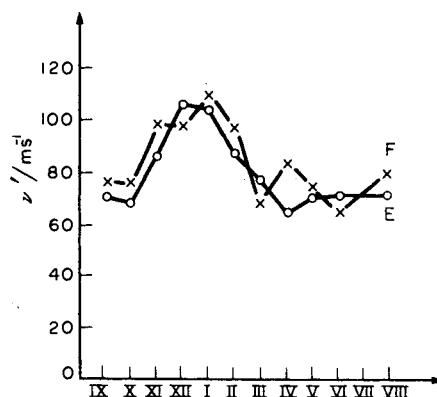


FIG. 2. The monthly mean velocity, v' , of the apparent drift, E - and F_2 -layers (1958-59). Rostov-Don.

TABLE 3.

IGY/IGC stations	Predominant drift directions in the E -layer
Rostov-Don	NE; SW
Har'kov	NE; SW
Irkutsk	SE; SW
Tomsk	NE; SW
Gor'kij	NE; SW
Cambridge	NE; SW

Apart from the steady component, which changes with season, height, and latitude, there are diurnal and semi-diurnal components of the drift vector.⁸⁻¹⁰ At all stations the semi-diurnal component was predominant. Also at Irkutsk this component is present for all periods of observation, though in summer and autumn it is very weak. As expected for the northern hemisphere the vector of the drift has a clockwise rotation.[†]

As the observed movement includes several superimposed periodic components with variable phases the comparison with a general circulation theory is difficult. A contribution to this question may be obtained by comparing the drift of meteoric trails and ionospheric irregularities simultaneously. In the E -layer the ionized component is a passive admixture which must be carried away with the neutral gas.¹¹ If the comparison is successful the ionospheric and meteoric drifts can be related to the actual winds, v . In Fig. 3 the data are given for a harmonic analysis of the NS and EW meteoric drift components for Har'kov [March-May 1960].¹⁰ The stable character of the movements at the E -layer

† MARTYN, D. F., (1947) *Proc. Roy. Soc. (Lond.) A* 189, 241.

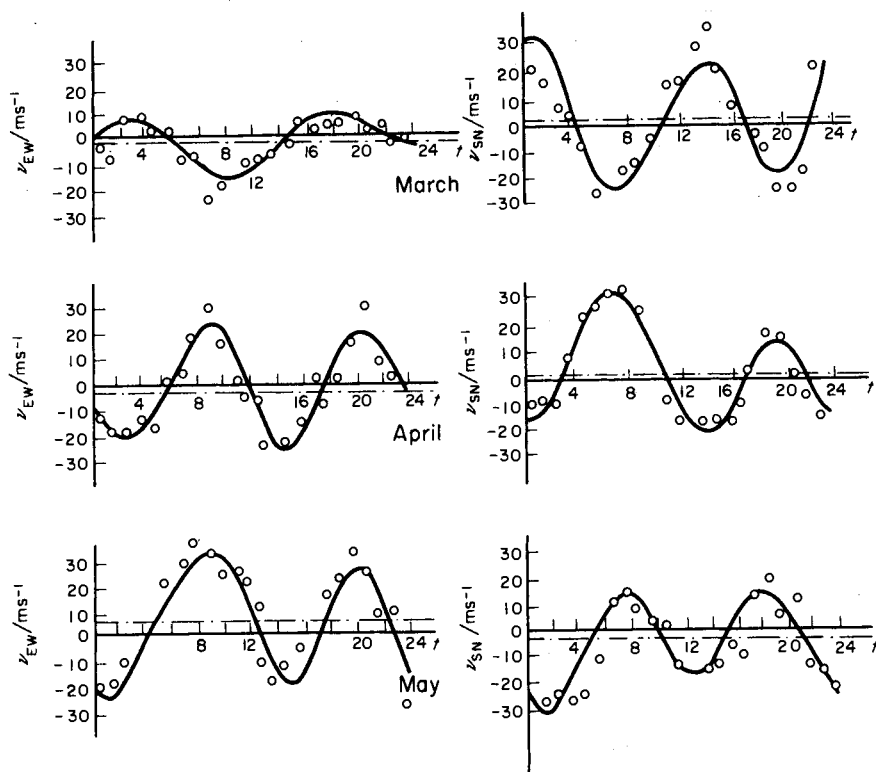


FIG. 3. Steady components and monthly mean diurnal variations of the EW and SN components of the meteoric drift. Har'kov (March–May, 1960).

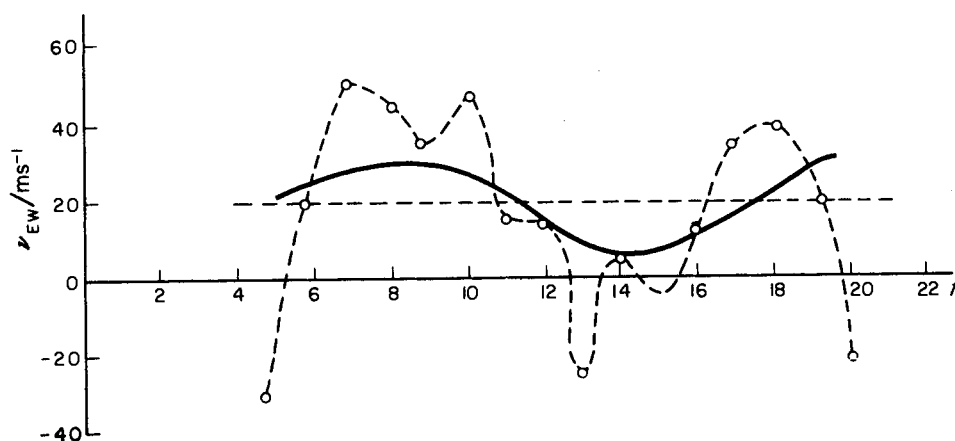


FIG. 4. Mean diurnal variation of the EW drift component, E-layer, Har'kov (March–May, 1960).

level and intense semi-diurnal wave are clearly visible. These data are similar to those obtained at Jodrell Bank[†]. At 06.00 local time we observe the northern direction; this is not too far from 07.00 local time as predicted by the tidal theory. Figure 4 shows that results of harmonic analysis of drift v' are considerably larger than for the meteoric drift v . This disagreement might be the consequence of the difference in the heights of the drifts. If this is true we could report a satisfactory qualitative agreement with the theory.

As a development of the IGY/IGC program, Ashabad began regular observations of movements in the E_s -layer (from May 1960). Both the small spaced reception and the correlation analysis were used on a frequency of 4.1 ± 0.9 MHz^{12, 13}. The E_s drift velocities lay within 10–350 m/sec, but the most probable value was within 48–75 m/sec. It was noted that the predominant drift directions were 100° (day-time) and 215° (night-time). The relationship between v' and magnetic activity was absent until $K = 5$. The semi-diurnal component exists; relationships with meteoric data were not obvious.

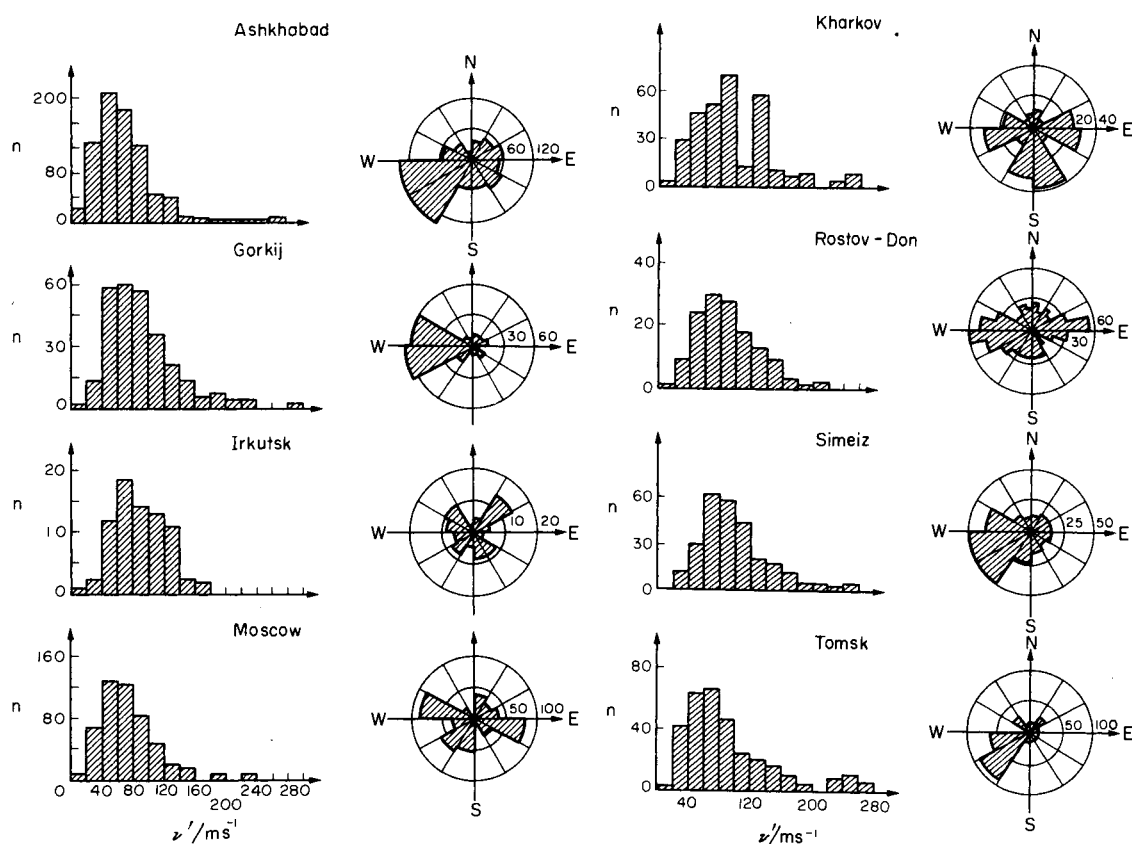


FIG. 5. Histograms of v and Φ' as whole year distributions for the drift stations of the U.S.S.R. 1958.

[†] GREENHOW, I. S. AND HALL, J. E., (1960) *J. Atm. Terr. Phys.*, 18, 203.

Region F

A more careful analysis was carried out of the $F2$ -layer data. The observation of the small-scale irregularities revealed common features of the drifts at all stations.

The value of v' varied from 10 to 500 m/sec. There is good similarity in the overall statistical distributions of v' for different seasons, years, and stations as for the E -layer.^{7-9, 14-17} The most probable values are found within 60–80 m/sec. Regular seasonal, latitudinal or longitudinal variations were not found. For example, in Fig. 5 a, b, the distributions of v' for all stations are given for 1958 and for Rostov for 1950–59. As a rule v' slightly increased at night. In contrast to E the $F2$ -layer shows a significant relationship between the magnetic activity and v' . This relation is shown with the data of Tomsk in Fig. 6.⁸ The EW direction of the drifts was dominant for nearly all stations (at night: W; in the daytime: E). For Irkutsk and Har'kov it was difficult to distinguish a steady component; this may be a consequence of insufficient data. Figure 5 also shows histograms of Φ for 1958.

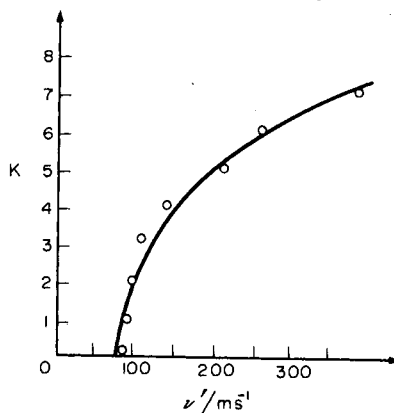


FIG. 6. Relation between drift velocity, v' , in the $F2$ -layer and magnetic activity index K . Tomsk.

The data of some stations (Moskva, Ašhabad, Tomsk, Irkutsk) were processed by harmonic analysis. The most careful processing was carried out for the data of the Moskva (IZMIRAN) station for the period from 1956 to 1959. It was found that the most important component in the $F2$ -layer is a diurnal one.

The analysis revealed that the diurnal EW component has amplitudes in the 11–46 m/sec range with 26 m/sec as mean value. The maxima were 2–3 h after noon and midnight. The second harmonic has smaller amplitudes, the mean value was 16 m/sec, but it was difficult to establish clearly the phase of this harmonic. These data are in qualitative agreement with tidal theory. The same conclusion was obtained for the data of other stations.^{8, 9, 16} The first harmonic of the NS component was in the 1–57 m/sec range and had 16 m/sec as mean value, less than tidal theory predicts. Its maxima were at 06.00–08.00 and 16.00–18.00 local time, which does not agree with present tidal theory. As a rule the rotation of this component was clockwise.

* The data and calculations were carried out and presented by Ju. V. Kušnerevskij (Moskva IZMIRAN).

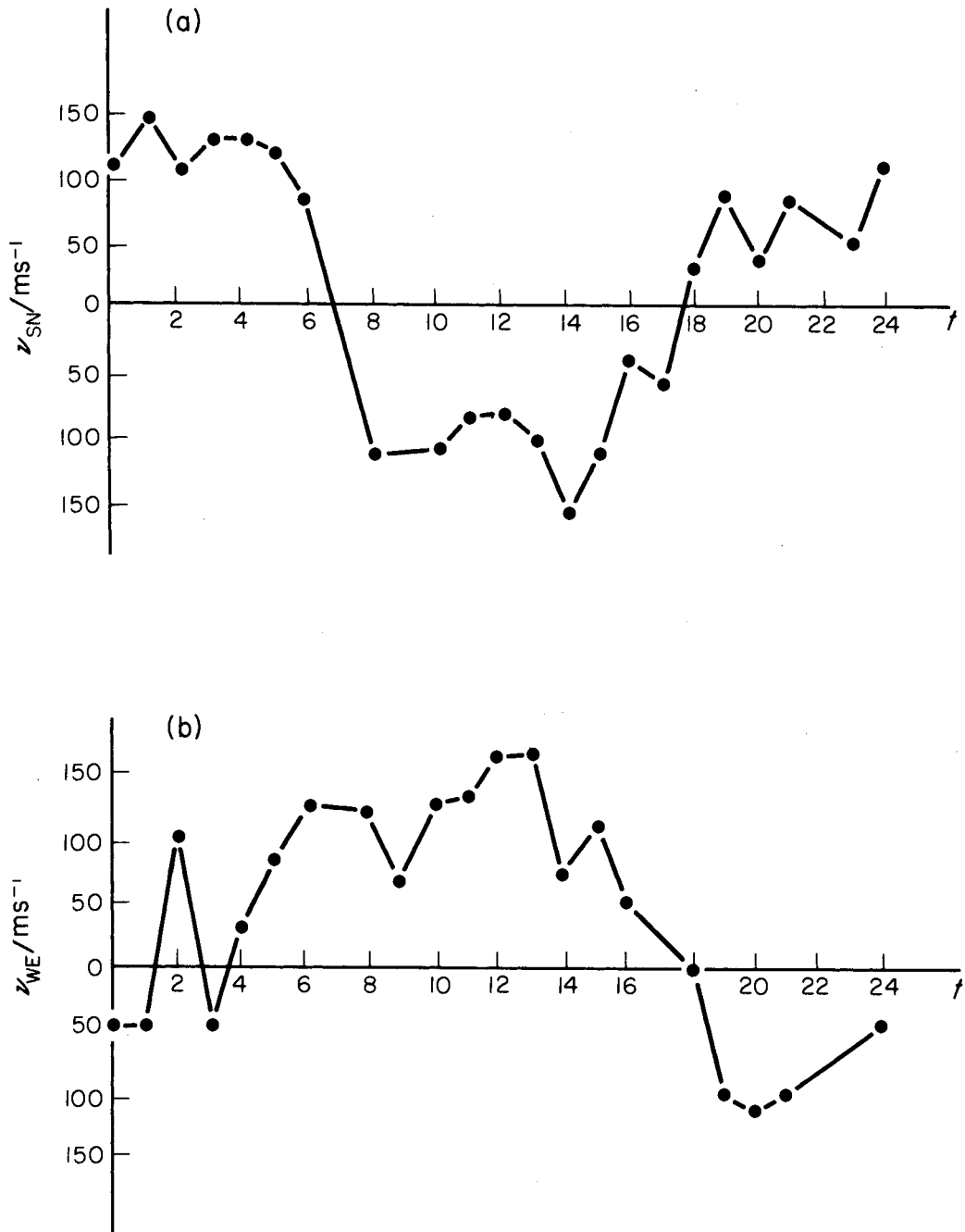


FIG. 7. Mean diurnal variation of the WE and SN drift components in the F_2 -layer obtained from observations of large-scale irregularities. Moskva MSU (1958).

The data we have do not allow us to conclude that there is full agreement with the tidal theory, but in many cases there is some quantitative support of the theory.

The phase drift observations of the large-scale irregularities (tens and hundreds of km as base length) were carried out in Moscow (MSU). The correlation analysis of the IGY/IGC data gave a rather wide scattering of the true velocity value, v , from 20 to 300 m/sec. The most probable value lies in the 85–170 m/sec range. According to other investigations[†] v should be found larger here than for small irregularities. A predominance of northern or southern directions was found. There is also a clear diurnal variation which is given in Fig. 7. Other investigators^{††} indicate eastern and western drift directions as predominant for these irregularities. The difference may be connected with the fact that no account was taken of the anisotropic form of the irregularities or of the preference for the anisotropy axis to have a certain orientation. In our case, with phase measurements processed by the correlation analysis, the prevalence of the SN component was detected. In fact a significant anisotropy and preferred orientation was obtained for large irregularities.^{18, 19} In Fig. 8 histograms of the different drift-velocities are given for 1957–58. v' obtained without taking into account the anisotropy (Fig. 8a) has a prevalence of a direction of 135° (EW). The same data processed by the correlation analysis (Fig. 8b) indicate a large SN component. As to the small-scale irregularities the simultaneous processing of the data for 1959¹⁴ confirmed the presence of mainly EW drift directions.

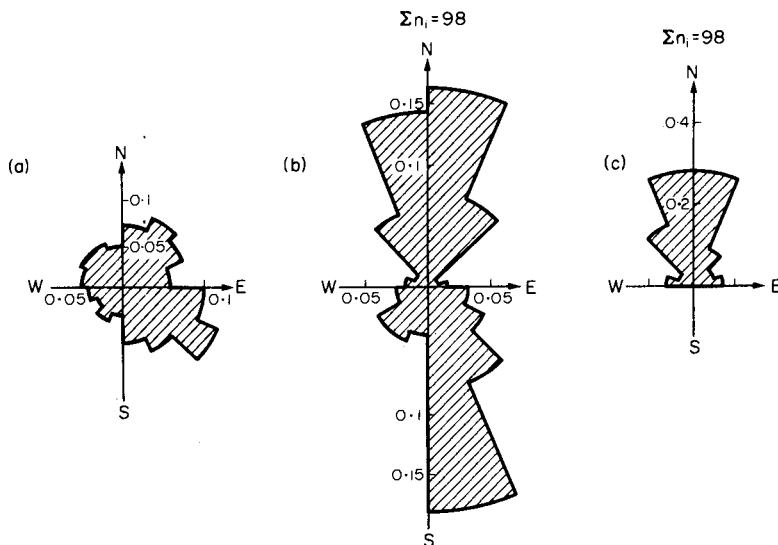


FIG. 8. Histograms of the drift direction as obtained: (a) not taking account of possible anisotropy; (b) considering anisotropy and turbulence; (c) histograms of the anisotropy directions. Moskva, MSU (1957–58).

† WELLS, H. W. (1957), *Polar Atm. Symp.* Pt. II p. 33. Pergamon Press.

†† THOMAS, L., (1959) *J. Atm. Terr. Phys.* 14, 123.

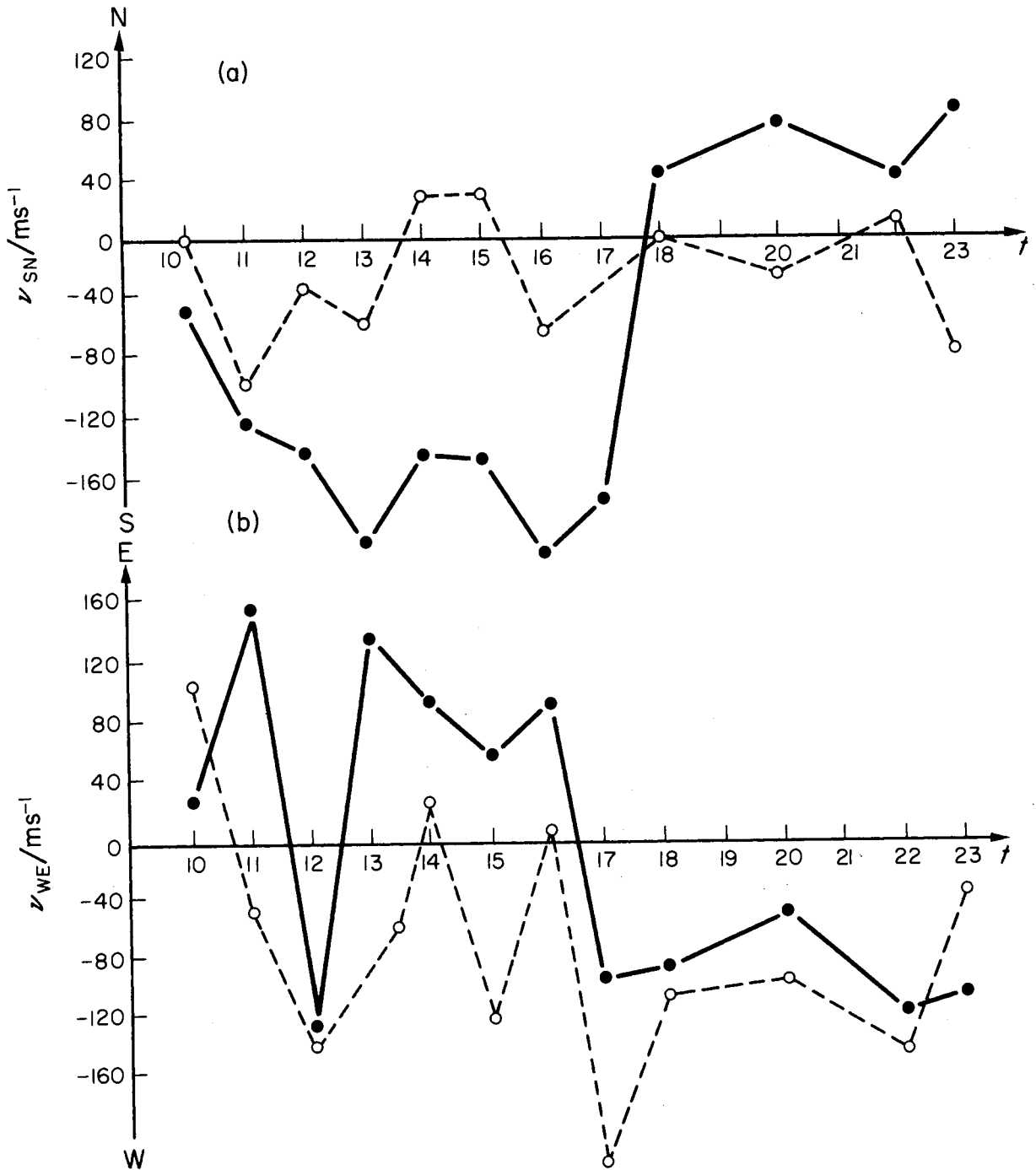


FIG. 9. 24 h variation of WE and SN components of the velocity of the drift for small-scale (dotted line) and large-scale (full line irregularities in the F_2 -layer, Moskva (October 10, 1958).

The spaced receiver investigations with the phase method were supplemented by investigation with frequency-shift with frequency differences from 0.5 to 4 MHz²⁰. These shifts correspond to vertical spacings of the reflecting levels of 5 to 25 km. For these experiments the common correlation analysis⁴ was generalized and applied to the media with three-dimensional characteristics.^{21*} These investigations indicate that there is a significant vertical drift component with the mean value of 12 m/sec the r.m.s. value being 85 m/sec.

The drift of large scale ionospheric disturbances (fronts from 400 to 1500 km) was determined from ionograms of the ionospheric stations Moskva, Leningrad, Sverdlovsk, Rostov, etc.²² The analysis of some 267 cases showed that the most probable effective speeds were 80–100 and 140–180 m/sec. Only the W direction was observed and the histogram showed mainly values in the 160–350° range.

An attempt was made to compare the drifts of small and large irregularities at the same point (Moskva).²³ The large irregularities have higher velocity, and the prevailing drift directions do not coincide, but 24 h observations showed that there is synchronism in the behaviour of the drift of the small and large irregularities. This synchronism is shown in Fig. 9. Observations of large-scale irregularities show that the observed phenomena are due to plasma waves in the ionosphere without any tidal character rather than to true movements of the medium. The synchronism, as shown in Fig. 9, indicates that there is a common cause that influences these processes.

3. Form and Orientation of the Anisotropy Axis and Random Changes of Irregularities

When dealing with "drifts" and "ionospheric irregularities" we are concerned with the structure of the diffraction pattern on the earth's surface. The general question arises how the structure of the pattern is related to the irregularities of the ionospheric plasma. It is true that there is some reason to suppose that the anisotropy axis and the drift direction of the diffraction pattern and of ionospheric irregularities sometimes coincide, but this is not so for the dimensions of the irregularities and their height localization. It is important to bear in mind this remark.

Some stations processed their records with the help of the correlation analysis. It was found that the ionospheric irregularities have rather pronounced anisotropy of form.^{12–14, 17, 18, 23–25} The mean value of the anisotropy ratio M for E_s and F -echoes varied from 1.4–2.7. For F_2 -echoes it lies in the 1.4–2.3 range. The direction of elongation is always near to the line of magnetic force with larger or smaller dispersion around this direction. This direction is particularly prominent for large-scale irregularities.¹⁸ So it can be supposed that the anisotropy of irregularities is related to the differences of the diffusion coefficients along and across the geomagnetic field. Initially isotropic irregularities stretch along the geomagnetic field.

Estimates of spreading time confirm this hypothesis²³.

Table 4 gives the mean and most probable values of the anisotropy ratio e , the angle φ between the SN direction and the major anisotropy axis, the characteristic velocity of the random changes v_c , and the ratio of v_c to the regular drift speed v .

* See also report by GUSEV, V. D. and MIRKOTAN, S. F. to the Ionospheric Symposium, Nice, Dec. 1961.

TABLE 4

Station	Parameter				Remarks
	e	φ	v_e	v_e/v	
Ashabad	2.7	At the day along the meridian	50 m/sec	0.9	E_s layer 3.2–5 MHz Data for 1960.
Moskva, IZMIRAN	2.3	50°, signif. dispersion	25–50 m/sec*	1.6	F_2 , 1959 (362 cases)
Moskva, MSU	2.3	0°	35–170 m/sec*	1.5	F_2 large-scale irregularities, 1957–58
Murmansk	1.9	–15° ... –55°*	—	0.6	F_2 , some cases
Rostov-Don	1.4–1.6*	—	—	0.8–1.2*	F_2 , 30 cases
Simeiz	1.6–1.8*	Signif. dispersion for $e < 5$ and SN orientation for $e > 10$	—	—	radioastron. observations (80 cases) relative to heights above F_2 peak

* most provable values.

According to simultaneous spaced and frequency-shift observations²⁰ the large-scale irregularities have an ellipsoidal form with the axes ratio 4:2:1. The major anisotropy axis was most frequently orientated in the NS direction with its northern end inclined towards the ground, i. e. towards the true direction of the inclined geomagnetic field, by an angle of 13.5°. The direction of the minor axis was close to the vertical. The large-scale irregularities occupy a considerable part of the F_2 -layer in height. Table 4 confirms that the ratio (v_e/v) reaches the value 1:1.5.^{13, 14, 18**} So the small-scale irregularities are to a great extent subjected to turbulent movements in the ionosphere.^{16, 23}

** YERG, D. G., (1957) *Techn. Rep. Solar Terr. Res. for 1956*, 1, 138.

4. Some additional investigations

Theoretical studies concerning the dynamics of the ionospheric plasma will not be reported here, since they are described in a special review article.¹¹

The localization in height of the ionospheric irregularities is still unsolved. The results of the observations of the signals of the first satellite on 40 MHz made it possible to determine the region of intensive occurrence of irregularities in the height range 270–325 km, and to evaluate the size of the irregularities.²⁶ These data are similar to the results obtained at another location.*

Aircraft observations of the drift in the Arctic region (83°N) have been carried out. It was found that the drift had a value of 50–70 m/sec in EW direction.²⁷

Particular studies of polarization²⁸ allowed us to estimate the influence of these effects on the drift measurements; certain recommendations are given to that effect.

Several investigations were made in order to check the applicability of the correlation analysis, and to promote its development.^{4, 21, 29–32} Resulting from these investigations a simple criterion was established for the applicability of data for the correlation analysis.^{31, 33} Indications have been made for taking into consideration the behaviour of the ionosphere and to minimize its influence on the drift results.³¹ A comparison of the correlation analysis and the method of similarity allowed us to show that the value and direction of drifts can be determined by the second simple method with sufficient accuracy.¹⁴

The analytic form of the plane correlation analysis was generalized for the three-dimensional case²¹; from this it is possible to obtain three-dimensional parameters of the large-scale irregularities and also the horizontal drift component v . It has been shown that the characteristic velocity of the random changes, v_c , obtained by the spaced reception method, may be overstated due to the presence of this vertical velocity component.

The influence of the specular component of the reflected signal on drift measurements has been investigated.³³ This study revealed the necessity for corresponding corrections.

5. Conclusion

The existence of irregularities and intensive regular movements (drifts, winds) are standard features of the ionosphere. In the lower ionosphere winds and drifts are observed with a dominating semi-diurnal component. The value and direction of the drift changes with height, latitude and season; such influences are subject to diurnal variations. There is no relationship between drift in the E layer and magnetic activity. Although there is quantitative agreement with the tidal theory, there are some difficulties in numerical comparisons.

In the F_2 -layer there is a steady drift which is primarily diurnal. Probably, the influence of the tidal lunar forces on the F -region is weak. The drift in the F_2 -layer is connected with the magnetic activity. The drift results obtained from large-scale irregularities differ from those obtained from small-scale ones. These differences indicate the existence of two processes in the ionosphere. One is the real wind or drift of the medium, and the other might be plasma waves.

* KENT, G. S. and KOSTER, J. R., (1961) *Nature* 191, 1183.

The geomagnetic field has considerable influence on the form of ionospheric irregularities. The irregularities, particularly the large-scale ones, have an elongated shape along the geomagnetic field.

Data available support the theory of the origin of drifts in the $F2$ -layer due to the transit of the electric field from the E - to the $F2$ -layer, but the numerical comparison also indicates differences between the theory and the observations.

In order to solve these problems further studies should include complex investigations applying various methods of observation: surface sounding, radioastronomical and meteor observations, launching of rockets and satellites. The most promising and direct method is the application of rockets and satellites. It is expected that during the IQSY many problems connected with the problem of movements in the upper atmosphere will be solved. However, much can be done by the analysis of the great amount of the IGY/IGC materials. The difficulty lies in the reduction of this material.

It is vitally important, that the IGY/IGC data should be presented in a form suitable for quantitative and qualitative comparisons.

4.2. ANISOTROPY OF SMALL-SCALE IRREGULARITIES AND MOTIONS IN THE F_2 -LAYER

JU. V. KUŠNEREVSKIJ and E. S. ZAJARNAJA,*

THIS paper presents results of measurements of the motions in the F_2 -layer of the ionosphere for September 1959, reduced by both the similarity method and by correlation analysis.† The observations were made during eleven days of that month, according to the International Geophysical Cooperation Calendar, and for some supplementary days adopted specially by the Soviet Union stations. The schedule was 5 to 7 min every hour beginning on the hour. At night, however, it was often impossible to make observations because of strong interference by broadcasting and other stations or because of important spread. Therefore most of the measurements refer to the day-light hours. Altogether 106 measurements were made of which 44 only were treated by the similarity method.

1. Shape of Irregularities

The shape of the irregularities is represented as a "characteristic ellipse" (anisotropy ellipse). The axial rate of the ellipse, e , is a measure of its elongation, while the angle φ , defines the preferred elongation (the orientation of the major axis). From the distribution of e it has been found that its value varies from 1 (isotropic case) to 5.5, the most probable values ranging from 1.5 to 2. The average value is $e = 2.1$. No significant variation of e with time within the 24-hour period has been discovered, except that in the evening and at night values $e > 3$ were more frequent. Our data are in good agreement with those obtained by other authors. (5, 23, 24, 25)††

The distribution of the major axis orientation (values of angle φ) is presented in Fig. 1.

The range of variation φ is seen to be wide. The average value is $\varphi = -12^\circ$ and the most probable values of that angle lie close to the NS direction. This is particularly evident from the variation of φ with time in the course of 24 h. Before noon the most probable values of φ lie within $20-30^\circ$, while during afternoon hours they range within $40-50^\circ$. So it may be stated that small-scale ionospheric irregularities are elongated preferentially along the lines of force.

2. Size of Irregularities

The dimensions of small-scale irregularities were determined from the formula $\Delta = 2\tau_{0.5} v_c$, where $\tau_{0.5}$ is the radius of correlation defined as the time necessary to reduce the autocorrelation function down to 0.5, and v_c is the characteristic velocity along the major or minor axis of the anisotropy ellipse⁵.

* Izmiran, Moscow, U.S.S.R.

† *I.G.Y. Annals* vol. III, Part III (1956).

†† PHILLIPS, G. J. and SPENCER, M., (1955) *Proc. Phy. Soc. (London)* 68 B, 481.

These and the following references see Parts 1—3(d)(ix), U. S. S. R.

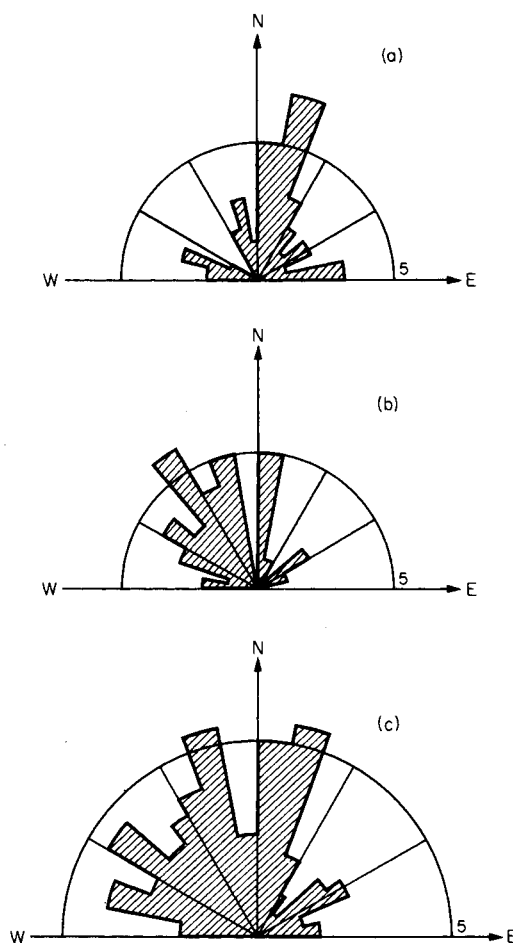


FIG. 1. Orientation distribution of the major axis of the anisotropy ellipse (September 1959): (a) 06.00–12.00; (b) 12.00–18.00; (c) for the 24 h. The number of cases is indicated along the radius.

Figure 2 shows the respective size distributions of the irregularities along the minor axis of the ellipse ($\Delta_{\min}$) and along its major axis ($\Delta_{\max}$). It may be seen that along the major axis the size of the irregularities, $\Delta_{\max}$, ranges from 200 to 3800 m, and along the minor axis, $\Delta_{\min}$, the range of variation is 0–3800 m. The most probable value for $\Delta_{\max}$ lies within 800–1000 m, while that for $\Delta_{\min}$ is within 200–400 m. The average values are $\Delta_{\max} = 1300$ m, $\Delta_{\min} = 660$ m. There is a pronounced decline in the size of the irregularities from day to night. Thus the average value of $\Delta_{\max}$ diminishes from 1220 to 860 m, and that of $\Delta_{\min}$, from 840 to 600 m.

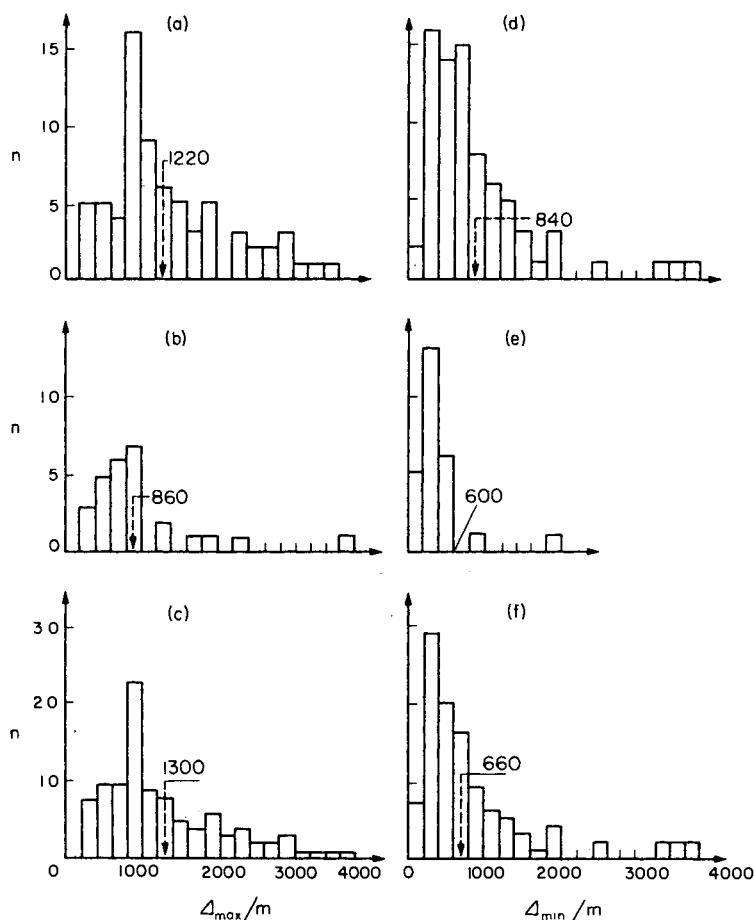


FIG. 2. Size distribution of irregularities (September 1959) along the major ($\Delta_{\max}$) and minor ($\Delta_{\min}$) axes of the anisotropy ellipse: (a) and (d) for 06.00—18.00; (b) and (e) for 18.00—06.00; (c) and (f) for the 24 h. Average values are indicated by arrows. The number of cases is plotted along the ordinate axis.

3. Drift of Irregularities

The velocity and direction of the drift of small-scale irregularities was determined by the similarity method (44 observations) and by correlation analysis (106 observations). It can be seen that the data dispersion has tripled as compared with the similarity method. Comparison of the mean time shifts, as determined by the two methods, show good agreement for most cases. In some examples, however, the similarity method gave a wrong time shift.

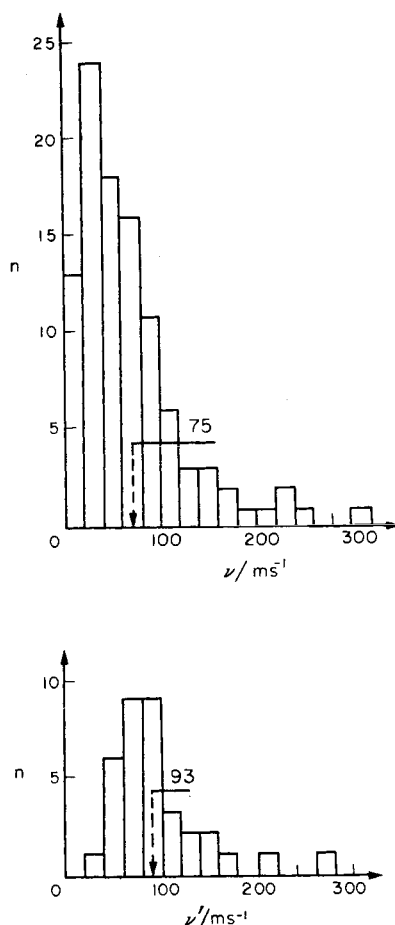


FIG. 3. Distribution of the drift velocity (September 1959): (a) correlation analysis; v (b) similarity method: v' . Average values are indicated by arrows. The number of cases is plotted along the ordinate axis.

In Fig. 3 distributions of the drift velocity v and apparent velocity v' as obtained by the similarity method are presented: v varies from 5 m/sec to 560 m/sec and v' , from 20 m/sec to 280 m/sec. The most probable values of the drift velocity v and the apparent velocity v' are between 20–40 m/sec and 60–100 m/sec respectively. It is evident that the drift velocities obtained by the correlation method are, as a rule, lower than those determined by the similarity method. The average values of the velocities v and v' are 75 m/sec and 93 m/sec respectively. The reason for the discrepancy is due to the fact that random processes play an essential part in the movements of ionospheric irregularities.

The direction of movement of the irregularities was likewise determined by both methods. The distribution of the drift directions is presented in Fig. 4.

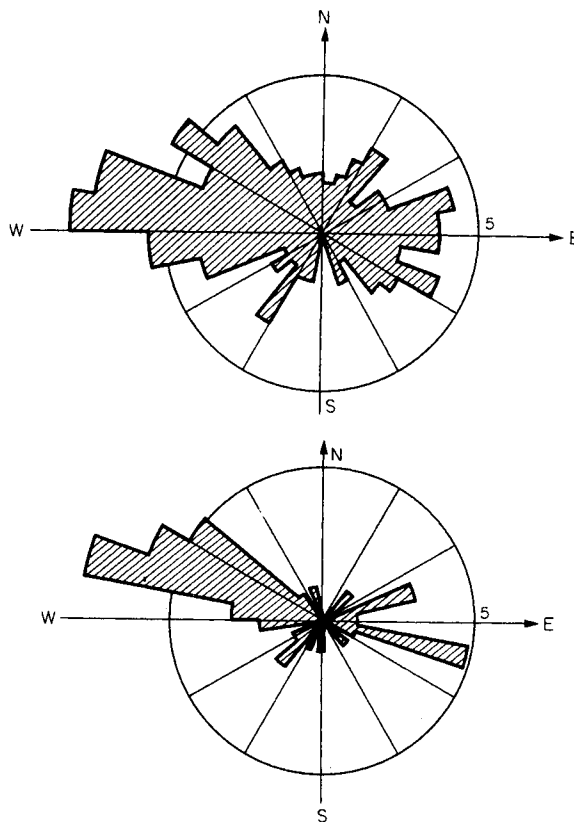


FIG. 4. Direction distribution of the movement of irregularities (September 1959): (a) correlation analysis; (b) similarity method. The number of cases is plotted along radius.

The agreement between the mean directions as determined by both methods is satisfactory. We mostly found western or eastern direction with a preference for the western direction. There is scarcely any movement toward the north or south. The most probable directions lie between 80 to 100° and 270 to 290° when determined by correlation analysis, and between 100 to 110° and 280 to 300° when determined by the similarity method. A diurnal variation of the drift direction has been found. The preferred direction was north-west at night, mostly west in the morning east or south-east in daytime and mainly west in the evening but eastern drift may also occur in the evening. The north-south and east-west components behave similarly, the former being northward at night and southward in the day-time, while the east-west component is westerly and easterly respectively.

4. The Velocity of Random Movements v_c and the "Life Time" of Irregularities, τ_c

In addition to drifts, random movements are of great significance in the ionosphere. The velocity of random movements is determined from the relation $v = \sqrt{v_c'^2 - v^2}$

where v'_c is the characteristic velocity, and v is the drift velocity. The velocity distribution of these movements in the $F2$ -layer shows that v_c ranges from 0 to 450 m/sec, the most probable values lying between 50 and 100 m/sec, while the average value is 107 m/sec. Occasionally the velocity of random motions becomes an imaginary quantity, i. e. v was larger than v'_c . It is of considerable interest to know the velocity ratio of random movements to regular drift, v_c/v . This ratio, which reveals the role of random processes in the ionosphere, has been found to vary from 0 to 7. Its most probable values lie within the range 0.5 — 1.0, but the average value is 1.6. Hence the velocity of random processes is generally higher than that of the regular drift of the irregularities.

Another characteristic parameter of small-scale irregularities in the $F2$ -layer is their "life time" τ_c .^{*} This value is determined from the relation $\tau = 2\tau_{0.5}(v'_c/v)$. τ_c has been found to vary from 2 sec to 36 s. The most probable τ_c values lie at 6.7 sec, while the average value is 9.8 sec. The lifetime distribution over 24 h shows that the average for the daylight hours is $\tau_c = 10.6$ sec and for the dark hours $\tau_c = 7.4$ sec. The decrease from day to night is directly related to the similar behaviour of the size of irregularities. This law of diurnal variation may be explained by diffusion processes.*

Conclusions

Ionospheric irregularities are considerably anisotropic. The average axial ratio of the anisotropy ellipse has been found to be about 2. The major axis tends to follow the direction of the magnetic meridian. The average sizes of small-scale irregularities along the major and minor axes of the ellipse are 1300 m and 660 m respectively. There is a reduction of size of about 1.4 times at night as compared to daytime.

In general, lower values are obtained for the drift velocity of small-scale irregularities when correlation analysis is used instead of the similarity method. This is due to the effect of the rather rapid random movements with an average velocity of 107 m/sec in the $F2$ -layer. The distribution of the ratios of random movement velocity to drift velocity shows that the most probable value of this ratio lies within the range 0.5 to 1.0, while its average value is 1.6. The drifts of small-scale irregularities in the $F2$ -layer have some preferred directions, their orientation being westward at night and eastward in the day-time. The westward component predominates. The north-south component of the drift velocity is oriented northward at night and southward in the daytime, while the direction of the east-west component is to the west at night and to the east in the day-time.

For the life time of small-scale irregularities an average of about 9.8 sec has been obtained, this value varying from 10.6 sec in day-time to 7.4 sec in the dark hours.

* ALPERT, JA. L., GINSBURG, V. L. and FEINBERG, V. L. *Rasprostranenie Radiovoln (Propagation of Radiowaves)*, Moscow, 1953.

4.3. CORRELATION ANALYSIS APPLIED TO MEDIA WITH THREE-DIMENSIONAL CHARACTERISTICS *

V. D. GUSEV and S. F. MIRKOTAN

THE paper gives a general correlation analysis for a Medium the properties of which vary at random with the *three* space coordinates and with time. The statistical distribution is supposed to be stationary in time, and homogeneous in space. The mean spatial characteristics of the irregularities, viz. anisotropy of the form, average dimensions of the irregularities, orientation of the main axes, drift velocity, v , velocity of the random changes, v_c , and some other parameters are determined.

The paper shows that the correlation analysis used at present for three-point measurements of the ionospheric irregularities is not applicable in the general case of the free orientation of the axes of the anisotropy and the presence of a vertical component, v_z , of the drift velocity. In this case, for instance, the velocity v_c , obtained with the three-point measurements, is larger than the true one on account of the presence of v_z . When applying usual three point measurements only the horizontal cross-section of the irregularities is determined,

* Full paper presented at the Nice Symposium of URSI (1961); published in Russian: ref. (21), p. 7.

4.4. STATISTICAL PROPERTIES OF THE IONOSPHERE[†]

V. D., GUSEV, S. F. MIRKOTAN, M. P., KIJANOVSKIJ and JU. V., BEREZIN.

THE properties of large-scale irregularities in the *F*2-layer and their effect on reflected radiowaves has been studied. At three points, spaced at 28—62 km, the variations of the phases of reflected signals were recorded. The method of correlation analysis was applied to study large-scale irregularities. Data are given on diurnal and seasonal variations of parameters of anisotropy, dimensions of irregularities, horizontal drift, etc.

Data were also obtained about the three-dimensional properties of irregularities, their orientation in space, the vertical component of the drift velocity, etc. (See preceding Chapter.

[†] Moscow State University, U. S. S. R. Full Paper presented at Nice Symposium (1961); published in Russian: ref. (31), p. 8.

4.5. SEASONAL ANOMALIES OF DRIFT DIRECTIONS IN THE LOWER IONOSPHERE REVEALED BY SPACED RECEIVER MEASUREMENTS IN THE *LF* RANGE

K. SPRENGER,*

DURING the IGY and the IGC, ionospheric drift measurements in the low frequency range have been performed at Kühlungsborn ($54, 1^{\circ}\text{N}$; $11, 8^{\circ}\text{E}$) with closely spaced receivers (600-m distance). The sky wave of a CW radio transmitter at 245 kHz, 180 km NNW of the receiving site was observed, the ground wave being suppressed by loop aerials. The similarity of the three fading traces was sufficiently good, and the time displacements of the individual fading maxima and minima amounted to several seconds. Records have been obtained continuously every night from sunset till 22.00 UT and from 04.30 UT till sunrise, always taking half an hour for one drift sample. The total number of statistically significant results was about 1000 during the period from 1957 to 1959. Since the reflection coefficient is only 0.1 or at most 0.2 it is believed that the results are not seriously affected by additional sky waves reflected more than once from the ionosphere. The reflection height is assumed to be between 90 and 100 km at night.

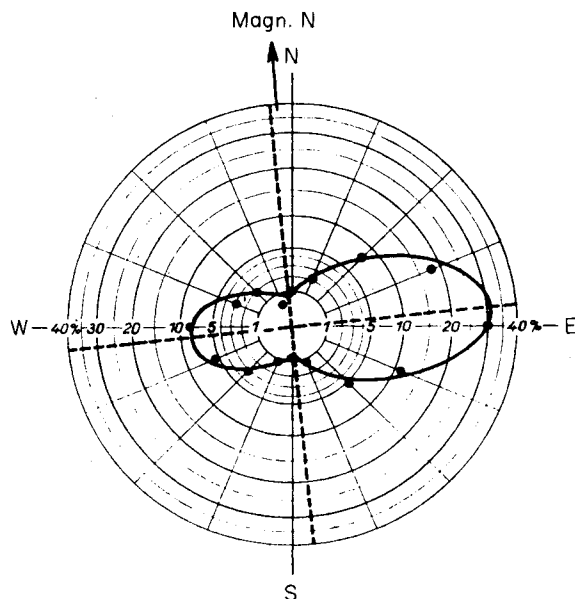


FIG. 1. Probability distribution of all night-time drift directions measured at Kühlungsborn from 1957 to 59 at 245 kHz. (The total number of individual observations is $n = 1010$. The dashed lines are the axes of symmetry of the distribution curve.)

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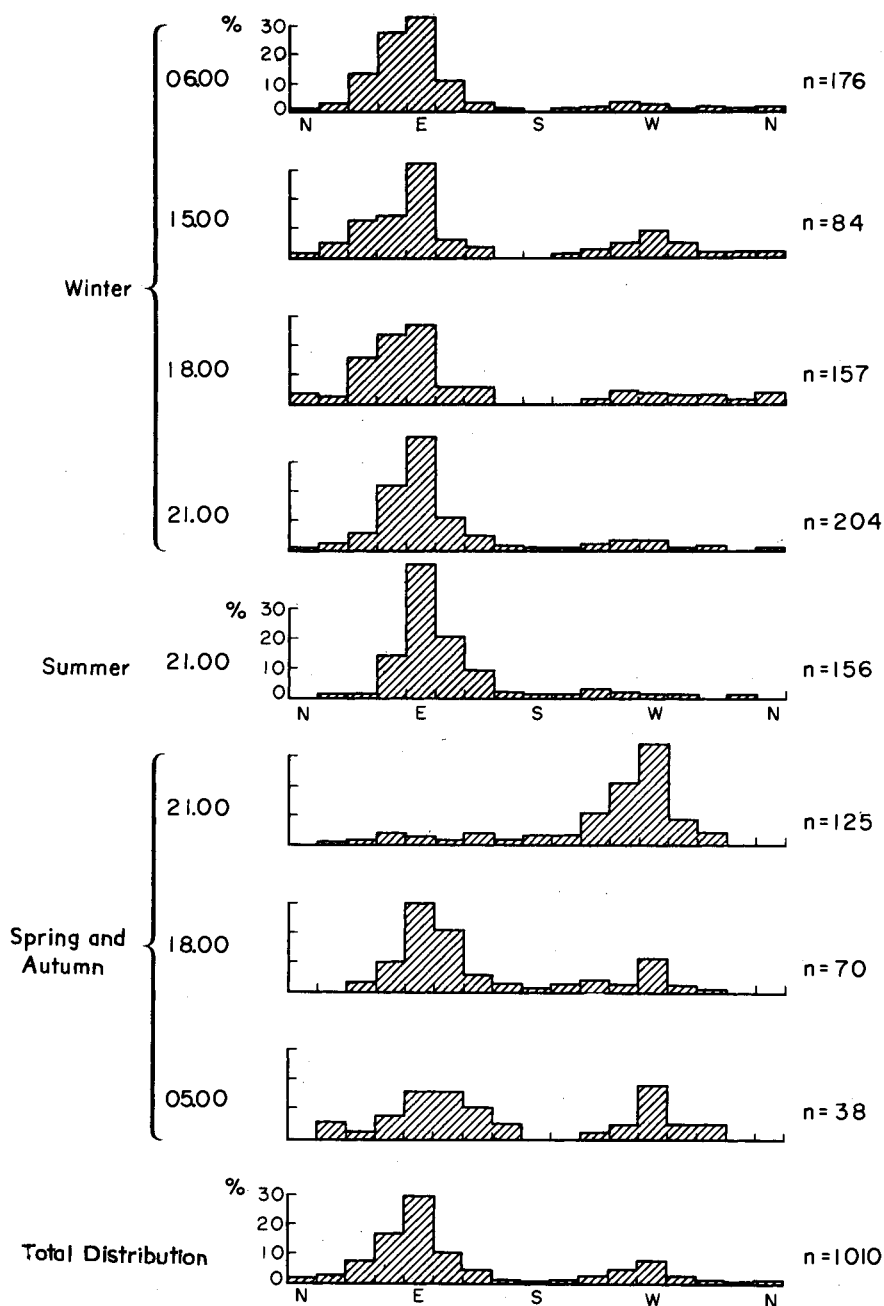


FIG. 2. Histograms of ionospheric drift directions measured at 245 kHz from 1957 to 59, produced separately for the various seasons (winter, summer, spring and autumn) and hours UT. (The bottom row is the sum of the eight rows above and is identical with Fig. 1.)

1. Results

The median drift velocity has been found to be 80 m/sec, with more than 90 per cent of all values between 40 and 160 m/sec. There was a tendency for slightly greater values in winter than in summer, for a slight increase of velocity during the night, and for strong increases during magnetic storms. The results have been obtained by the simple method of similar fades and not by a full correlation analysis. Thus, the velocities quoted above may be somewhat too great. But this fact does not affect the determination of the drift direction which will be dealt with now in this paper.

The overall probability distribution of all night-time drift directions observed at 245 kHz within the three years from 1957 to 1959 is shown in Fig. 1. It may be seen from this figure that the drift is almost entirely zonal, most frequently directed towards the east, less frequently towards the west, and extremely seldom towards the north or south. The declination being only a few degrees, no distinction between geographic and magnetic north could be made.

In Fig. 2 the probability distributions of drift directions are given separately for the various seasons and hours. There is a very clear predominance of eastern directions during winter and summer. During spring and autumn, however, the opposite direction is predominant, particularly in the later evening. All histograms show pronounced minima of occurrence at the directions south and north. At all seasons and hours, it is always more probable to get a direction opposite to the most probable one than perpendicular to it.

Figure 3 referring to 21.00 UT observations only (spring and autumn) shows distinct seasonal anomalies, occurring year by year at nearly the same dates. The spring anomaly

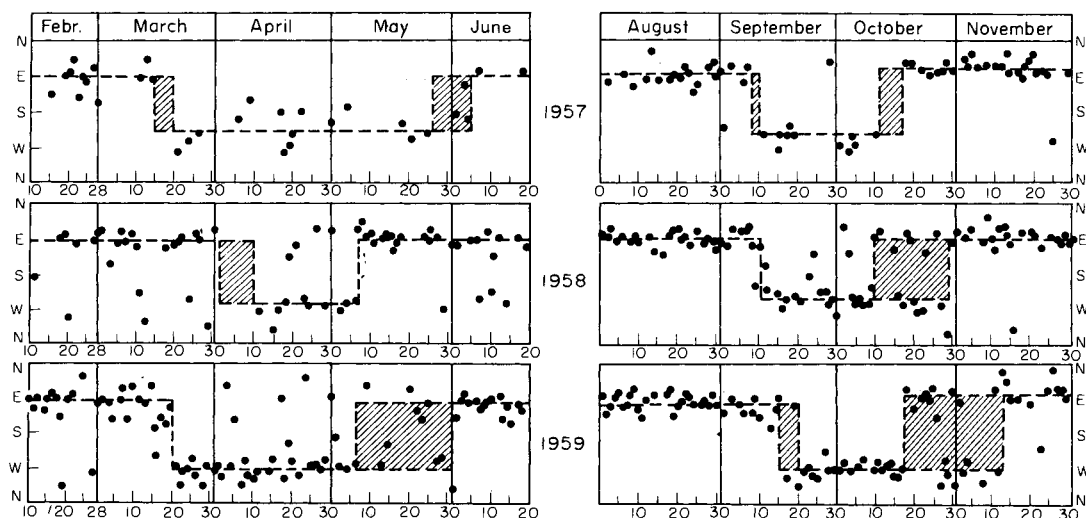


FIG. 3. Plots of the individual drift direction results obtained on 245 kHz at the 21.00 UT term. (The dashed lines represent the median values of the drift directions during the normal eastern and the abnormal western drift periods. The transition periods are marked by the hatched areas.)

lasts from the middle or end of March to May, and the autumnal anomaly from the middle of September to October. Sometimes the reversal is very abrupt from one day to the other. At other times we have a transition period of several days with alternating drift directions or without usable results; a gradual change-over has never been observed.

In Figs. 4 and 5 (diurnal variation) we distinguish only between the two main directions east (including NE and SE) and west (including NW and SW). The autumn anomaly

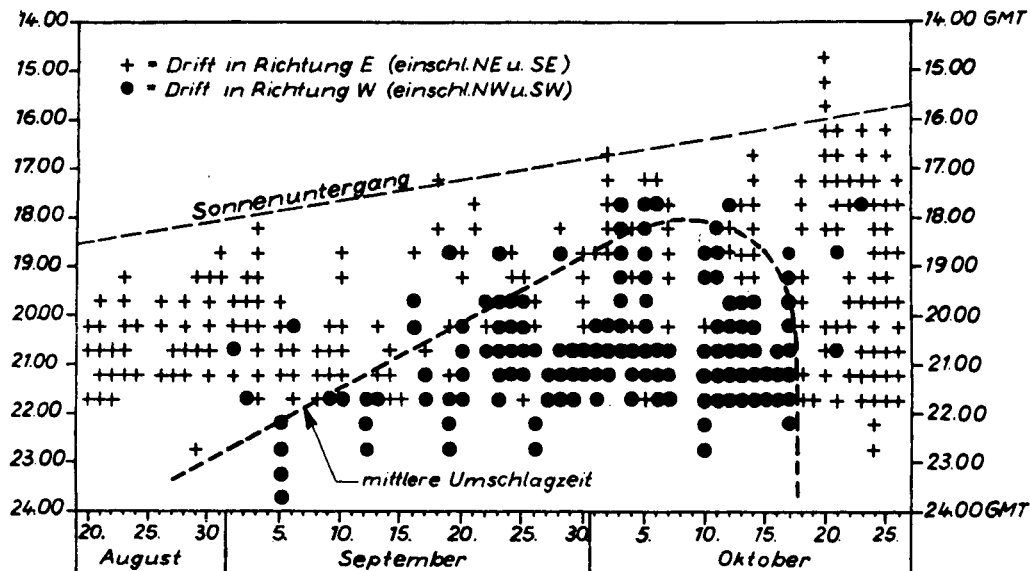


FIG. 4. The diurnal behaviour of the autumnal drift direction anomaly in 1959. (Normal eastern drift directions—including NE and SE—are marked by crosses. Abnormal western drift directions—including NW and SW—are marked by dots. The dashed lines represent the time of sunset and the mean time of the reversal, respectively.)

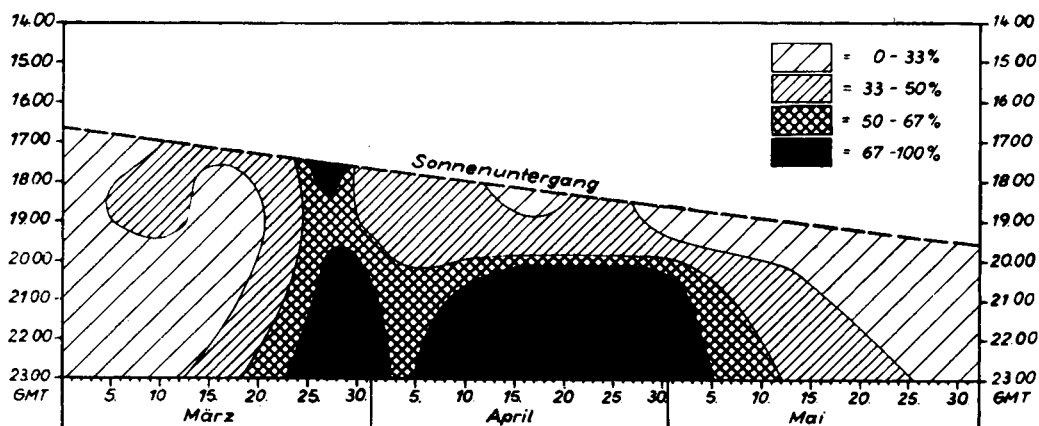


FIG. 5. The spring anomaly of drift directions (1957–59) as shown in terms of percentage of westerly directed drifts (including NW and SW).

consists in sudden reversals from east to west, occurring almost every evening after sunset. The average hour of the reversal lies first in the late evening hours, then with advancing season gradually approaches sunset until, by the middle of October, the anomaly disappears very suddenly from one day to the other. We obtain a corresponding picture in Fig. 5. The spring anomaly appears rather suddenly during the second half of March and gradually disappears in the late evening hours of May.

Unfortunately it has not been possible to make similar investigations for the early morning hours of spring and autumn because the observational material is too poor.

2. Discussion

One of the most striking results of the ionospheric drift measurements at 245 kHz mentioned above is the very narrow restriction of the observed drifts to the west-east direction. Fortunately this direction is nearly perpendicular to the plane of propagation; thus the phenomenon cannot be caused by phase effects between multiple components of the sky wave, which would result in apparent motions along the path of propagation. The phenomenon could be explained, however, if one assumed that the ionospheric irregularities in the reflection level are highly anisotropic. If they were extremely elongated in the direction of the geomagnetic field, it would only be possible to detect movements normal to it. But it is not believed that this can be the true cause of the observed lack of meridional drifts because such extreme anisotropy in the horizontal plane has never been found in the lower ionosphere at temperate latitudes. Thus we must conclude that the wind systems in the height range concerned are mainly zonal.

Furthermore, a striking feature of our results is that the drift often reverses very suddenly from the normal eastern direction to the opposite one, particularly in the evening hours of some weeks during spring and autumn. Because of the total lack of observations during day-light hours and from 23.00 UT to 04.30 UT we cannot decide whether these regular reversals are part of a general diurnal variation. In this case spring and autumn anomalies of the drift direction would be seasonal anomalies of the phase of that unknown diurnal variation. It is, however, highly improbable that such a general diurnal variation of the drift direction exists in winter; during this season the greater part of the day is covered by our observations. We suggest that the dates of the sudden appearance of the spring anomaly in March and of the sudden disappearance of the autumn anomaly in October may be connected with a fundamental conversion of the general circulation in the high atmosphere between summer and winter, as is known, for instance, from the lower stratosphere.

On the other hand, we must take into account that the reflection height of our wave is not constant throughout the night and year. Therefore our results may also be explained by a simultaneous existence of easterly and westerly directed wind systems, one closely above the other, the height of them varying diurnally and seasonally with respect to the reflection height of 245 kHz. In this case the spring and autumn anomalies of the drift direction would be seasonal anomalies of our reflection height relative to the height of the boundary between the two opposite wind systems.

4.6. DRIFT MEASUREMENTS OF THE *E*-REGION IN NORWAY AT KJELLER AND TROMSÖ

LEIV HARANG*

1. Place of observation: Kjeller, 59°58' N, 10°06' E.

Method of observations: similar fadings, received at three points placed in a right-angled triangle with bases of 130 m. Frequency: 2.1 MHz.

Method of recordings: The *E*-amplitudes were isolated through a gate and two methods of display were used, (a) the simultaneous recordings of the amplitudes on a 3-beam oscillograph, and (b) recordings of the relative time displacements between of the amplitude maxima using a Phillips recorder. The gate for isolating the *E*-echoes was placed in the interval 100–135 km height.

Presentation of the Results

At Kjeller the reflections from the normal *E*-layer are present only during a small number of hours each day in the winter season. Further, the Kjeller station was considerably disturbed during geomagnetic perturbations, *Es* is often present as irregular echoes or heavy absorption may occur which makes drift measurements impossible. It has therefore been difficult to obtain continuous measurements of the drift during a whole day or series of days, even during quiet periods. The material will therefore consist of a limited number of hourly values from various days. For the summer season the number is sufficient for obtaining the characteristic diurnal trend, for the winter season there have been difficulties in obtaining a sufficient number of hourly values.

The drift measurements at Kjeller were first conducted for about 14 months in 1954–55¹. In 1957–58 the drift recordings were continued with the same equipment. As an example of the monthly variation during summer time, the results from July–August 1957 are given in Fig. 1. In Fig. 2 are shown the wind vector diagrams during the summer season for the two periods of observation².

There is a close similarity between the values of the drift for the *summer* season during these two periods of recording. An harmonic analysis of the curves, using a three term Fourier representation $v' = a + c_1 \sin(t' + \epsilon_1) + c_2 \sin(2t' + \epsilon_2)$, gives the values listed on Table 1. The straightforward harmonic analysis of the material, comprising both the day and night portions (i. e. *E* and *Es* echoes) does not therefore seem to be physically justified. The diurnal (24 h) component which appears in the harmonic analysis and which is given in Table 1, seems conspicuous and may at least partly be considered as artificially introduced by adding together the *E*- and *Es*- drifts. ($t' = 15^\circ t/h$)

* Norwegian Defence Research Establishment, Kjeller.

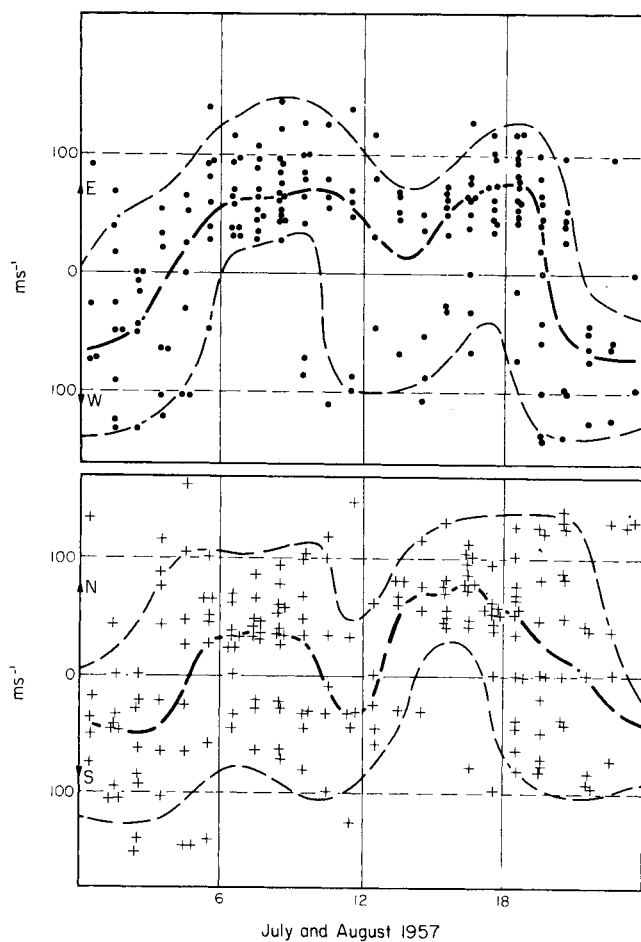


FIG. 1. The hourly values of the E-W and N-S drift components at Kjeller during July and August 1957.

TABLE 1. Summer values

			a	c_1	c_2	ϵ_1	ϵ_2
			m/sec	m/sec	m/sec	degr.	degr.
v'_x (E-W) Kjeller	1954-55		21	68	38	- 95	-103
v'_x (E-W) Kjeller	1957-58		14	51	39	-108	- 82
Mean:			17	60	38	-101	- 92
v'_y (N-S) Kjeller	1954-55		15	15	18	- 90	- 45
v'_y (N-S) Kjeller	1957-58		7	43	41	-121	- 79
Mean:			11	29	30	-105	- 62

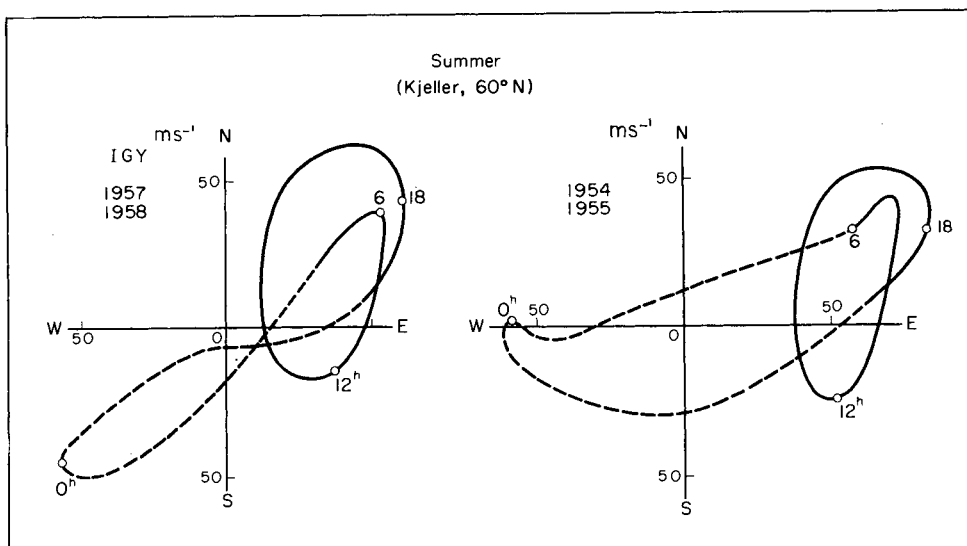


FIG. 2. The wind vector diagrams at Kjeller in summer during two-periods of observation. The continuous curve indicates the part of the day when the *normal E*-layer is present and a semi-diurnal period is present. The broken part of the curve indicates night-time conditions when only reflections from an *Es*-layer are present, the wind vector is in this case directed towards SW.

The wind vector diagrams for autumn, winter and spring are given in Fig. 3.

The semi-diurnal period, appearing as a double circle, is broken at night from 20 h to 5 h, during the summer season only. At night time when *Es* is present, the drift is mainly towards SW.

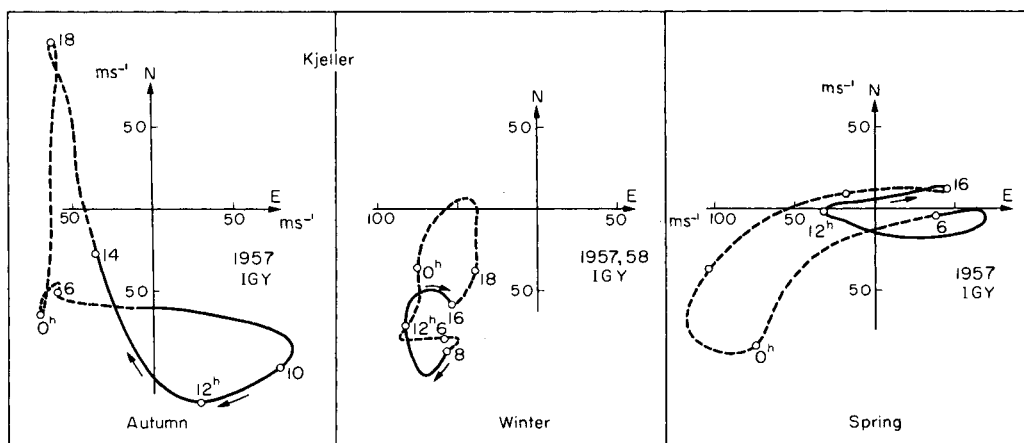


FIG. 3. Wind vector diagrams at Kjeller in the IGY during autumn, winter, and spring. The continuous curve indicates the part of the day when the *normal E*-layer is present.

The same general feature, although less distinct, is repeated in the diagrams for the three seasons of autumn, winter, and spring. We notice that during all the four seasons the rotation of the wind-vector *during day-time* is in the same direction. We also notice that the day part of the vector diagram is more regular than the night part when E_s has been recorded.

Looking at the wind vector diagrams in Figs. 2 to 3, it is apparent that the drifts consist of three parts:

- a *day-part* which consists of a semi-diurnal variation, appearing as a double closed circle only broken at night time when E_s has been recorded.
- a *night-part* when E_s has been recorded, the drifts are here mainly directed towards SW.
- a *regular and prevailing* drift in day-time, represented by a vector from origo to the centre of the semi-diurnal circle.

This vector which represents the prevailing drift of the normal E during day-time, changes its direction during the seasons.

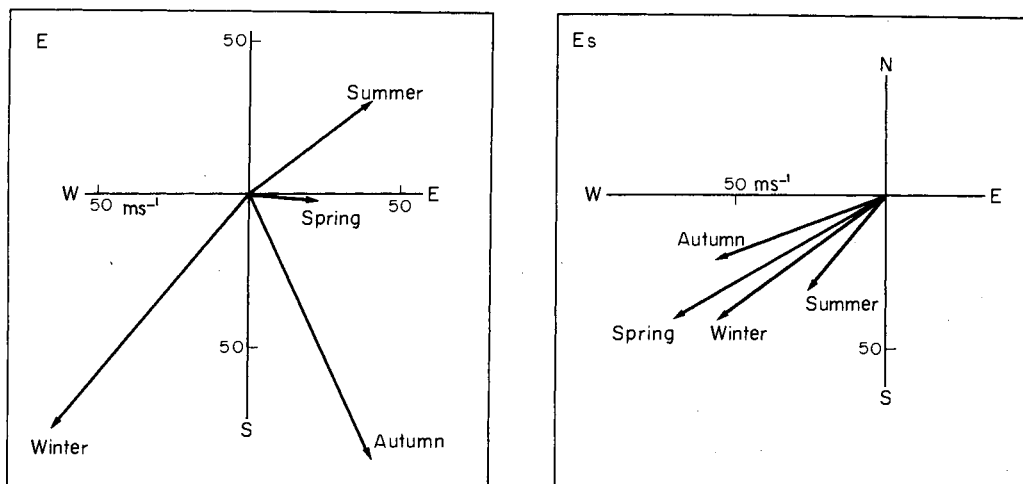


FIG. 4. The prevailing drift directions during the seasons of normal E (at day-time) and E_s (at night-time) at Kjeller.

The prevailing drift directions of the normal E and the E_s are illustrated in Fig. 4. The vectors indicating the drift of the normal E represent the distance from origo to the centre of the circle giving the semi-diurnal variation indicated in Fig. 3. The vector indicating the prevailing drift of E_s represents the vector from origo to the mean drift directions appearing at night-time.

2. Place of observation: Tromsø 69°40' N, 18°57' E.

Methods of observation and recording: similar equipment to that at Kjeller.

Presentation of the Results

The Tromsø station, which lies close to the auroral zone, is strongly disturbed and the character of the fadings is more irregular and rapid than at stations in middle and low latitudes. Recording equipment similar to that in operation at Kjeller was in use at Tromsø during the IGY, but the irregular character of the fadings made the application of the Phillips recorder difficult. It soon turned out that the diffraction pattern at Tromsø is usually highly anisometric, and an analysis of the material showed that it is not possible to present values of the drift components according to the simple scheme in use at stations in middle and lower latitudes. *E*-echoes which can be characterized as being reflected from the *normal E*-layer appear only in a small number of cases, the echoes usu-

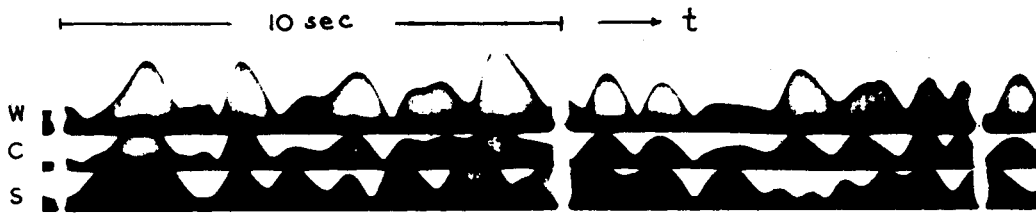


FIG. 5. Records of amplitudes of *Es*-echoes over the E-W and N-S bases at Tromsø. There is high correlation between the amplitude at the receiving points in E-W direction and a low correlation between the receiving points in N-S direction.

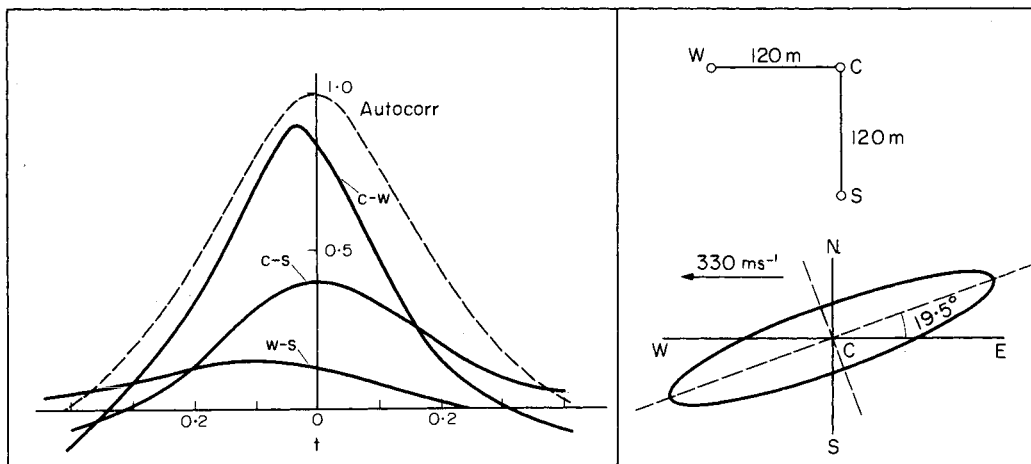


FIG. 6. Auto-correlation and cross-correlation functions from the sample in Fig. 5. The position of the ellipse of constant correlation in the diffraction pattern is indicated.

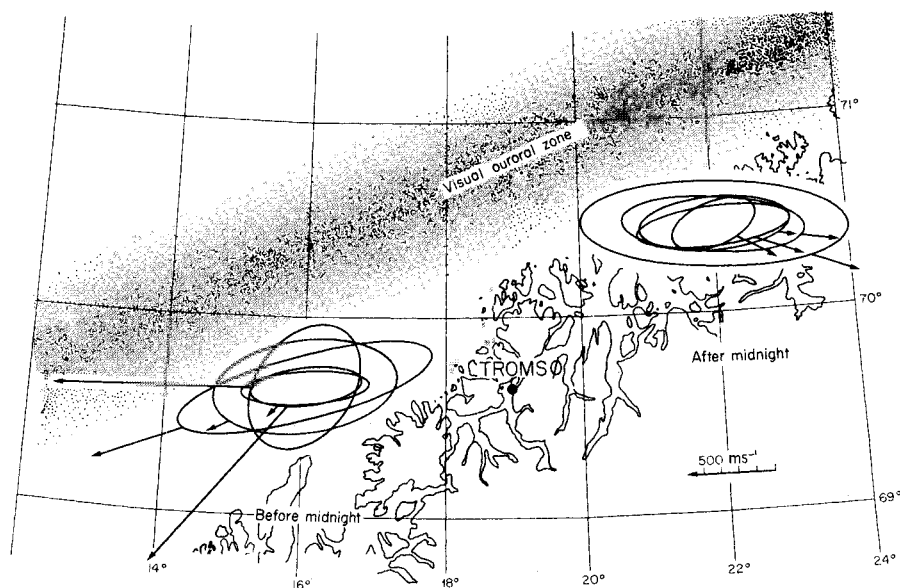


FIG. 7. Examples of correlation ellipses and drift velocities of the *Es* pattern observed at Tromsø (after MAEHLUM³).

ally appearing are *Es* of various types. It seems doubtful whether it is possible to obtain sufficient material for presenting drift effects of the *normal-E*-layer at a highly disturbed place like Tromsø.

The anisotropy of the *Es*-diffraction pattern made it necessary to use a full correlation analysis in order to obtain results of any interest. In the late part of the IGY period a series of amplitude recordings with a 3-beam oscillograph was therefore taken and a number of full analyses of the *Es*-drift were carried out. As a result of the drift studies made at Tromsø during the IGY the analysis of the anisotropy and drift of the *Es* will be presented.

The period of fading of echoes from the normal *E*-layer at Kjeller is of the order of 8 Hz. At Tromsø the period of fading was shorter, and during disturbances when *Es* appeared, which happened during most of the time, a fading period of about 1 Hz was frequently observed. During the phase of the positive polar geomagnetic storm, occurring at Tromsø at about 18 h, *Es*-echoes with a fairly regular fading period of about 1 Hz very often appeared. During stronger disturbances at night, the period of fading rapidly increased. These 1-s fadings of the *Es* could easily be photographed on a multibeam oscilloscope using a moving film, and a number of samples were taken during the winter 1957–58. The most remarkable feature of these fadings was the strong correlation between the fadings from the aerials in E–W direction and the low correlation between the fadings from aerials in N–S direction. This indicates that in the diffraction pattern there were “ridges” lying in E–W direction.

From a number of samples obtained, most of them recorded during the afternoon hours 17h–20h CET under conditions of moderate positive geomagnetic storms, similar

characteristics of the correlation were stated. In the example analysed the diffraction pattern on the ground was strongly elongated in E—W direction, and the “ridges” seemed to lie approximately parallel to the current system, which is responsible for the geomagnetic disturbances, and parallel to the auroral zone.

The analysis of the diffraction pattern of *Es* at Tromsö by correlation methods has been taken up by MAEHLUM³. He states that the drifts are mostly in E—W directions and drift velocities up to 1600 m/sec were estimated.

There is a significant change in the drift direction of the *Es* before and after midnight. Before midnight (during the phase of the “positive” geomagnetic disturbance) the drift is toward the west, after midnight (during the phase of the “negative” geomagnetic disturbance) the drift is directed towards the east. This change in drift direction of the *Es* corresponds to a similar change in the direction of the current systems producing the geomagnetic disturbances and also in the direction of movement of the visual auroral forms.

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4.7. DRIFT OBSERVATIONS DURING THE IGY AT HALLEY BAY

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DURING 1957, the drift measurements were severely restricted by high absorption, site noise and spread echoes, but, in January 1958, the sensitivity was raised considerably by installing larger loop aerials. The last few months of 1958 were also remarkably quiet ionospherically, which greatly increased the number of successful observations obtained.

Relatively few *E*-region observations were obtained in winter when the normal *E*-layer was not present. Successful *F*-region observations were rare between midnight and about 08.00 UT, since severe scatter was usually present for more than half the days in this period. Out of 190 days on which diurnal sequences of observations were attempted in 1958, only 24 gave usable observations for 16 or more hours per day while 81 gave usable observations for 8 or more hours per day.

At Halley Bay, the fading patterns could change fundamentally in about 15 min; hence, even when it was impossible to obtain a numerical drift measurement in one 5-min period, it was sometimes possible 5 minutes later. During the last six months of the IGY, the period of recording was extended beyond 10 min to take advantage of this fact.

Successful drift measurement at Halley Bay requires higher speeds for the paper, longer records and probably closer aerial spacing than is normal at lower latitudes. It is doubtful whether the automatic methods, such as that due to PHILLIPS¹, could be used successfully in the presence of the high noise level and the rapid changes in echo pattern found at Halley Bay.

It is known that, if the radio diffraction pattern on the ground is not statistically circular, the simple method of calculation can be in error; it is then desirable to use a more elaborate method. The full correlation analysis was applied, therefore, to a limited number of records in order to assess the veracity of the assumptions made in using the simple method.

The full analysis showed that, on the average, the ellipses of constant correlation were oriented with their major axes roughly along the magnetic meridian and that the axis ratio was about 1.8. The major and minor axes for a correlation of 0.5 were about 330 and 180 m, respectively. The mean speed found for the seven samples, 115 m/sec, does not differ significantly from that given by the simple analysis, 101 m/sec. Although the individual speeds differed by three to one, they were quite uncorrelated. It is clear that the individual measurements of speed were critically dependent on the method of analysis used.

The mean and individual values of the directions found by the two methods agreed very well. Three pairs of directions agreed within 1°, three deviated away from the meridian as expected and one deviated towards it. Thus the direction of drift could be found with considerable accuracy, the standard deviation of the departures being only 13°.

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If the most probable corrected directions, Φ , can be estimated from the observed values, Φ' by using the mean axis ratio and mean direction of elongation, the observed values of Φ' can be converted to Φ using Table 1. The assumption is only justified when forming averages of groups of data. The data in Tables 2 and 3 have been calculated in this way assuming an elongation of 1.8; the corresponding amplitudes, v were found by assuming that $v = v' \sec (\Phi' - \Phi)$.

1. E-region Drift

During 1958, the number of successful measurements of drift velocity varied from an average of 20 per month for the relatively disturbed months, February to July, to almost 200 in the abnormally quiet month of November. The disparity is enormous. It is concluded that the data are greatly biased in favour of quiet conditions.

The relative frequency of occurrence of either high or low speeds at different levels of magnetic activity confirms this conclusion. Table 4 shows, for three different ranges of the quarter-hourly magnetic index, Q , the percentage of occasions during December 1958 on which the drift speeds were less than 8.5 m/sec, between 8.5 and 170 m/sec, and greater than 170 m/sec. It is clear that large velocities were more frequently observed during disturbed periods.

Seasonal changes in the drift velocity were estimated by calculating the median values of the components of velocity for each hour, and evaluating the medians of these median values for each individual month. The direction, Φ' of the resultant velocity vector is shown in Fig. 1. The most probable speeds found were near 80 m/sec for the autumn and winter, and near 60 m/sec for spring and summer.

The percentage of occasions in which the drift was in a particular direction are shown as polar histograms for the four seasons in Fig. 2.

These results are based on calculations made by the simple method, which assumes the radio diffraction pattern at the ground to be statistically circular. If allowance is made for a statistical elongation, with an axis ratio of 1.8 along the meridian, the N-S

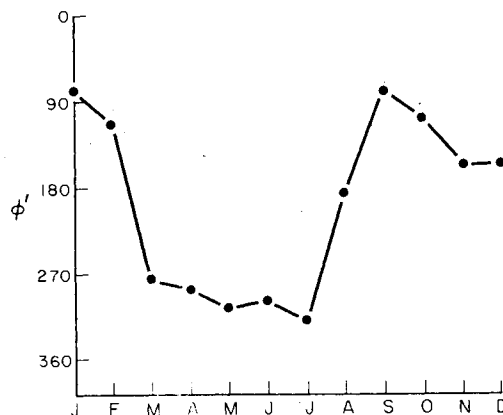


FIG. 1.

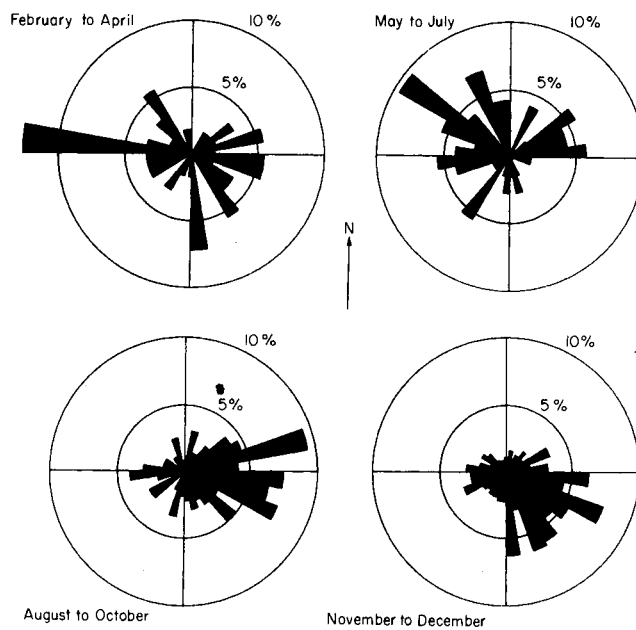


FIG. 2.

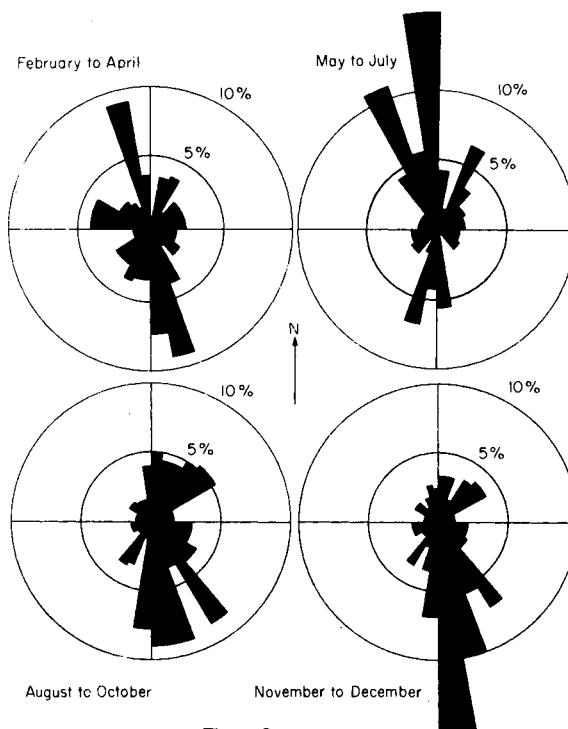


FIG. 3.

components of velocity will be greatly increased, thereby inclining the vectors in these directions. The results of a recalculation, in which an allowance has been made for this tendency, are shown as the polar histograms in Fig. 3.

The diurnal variation of the direction, Φ' , does not show clear evidence of any semi-diurnal rotation such as observed in the northern hemisphere². However, such variations can be detected in the data for certain individual months. The direction of rotation is then anticlockwise, the reverse of that found in the northern hemisphere.

2. F-region Drift

It was not possible to make satisfactory determinations of the *F*-region drift velocities either during disturbed periods, when the fading was too rapid, or when the operating frequencies were reflected from the normal, or the sporadic *E*-layer. Despite these limitations, successful determinations were made more frequently than for the *E*-region. The results given by the simple method of analysis are presented in Figs. 4 and 5, in a manner similar to that used for the *E*-region results. (Figs. 1 and 2).

The percentage distribution of speeds, v' , for the year as a whole (Fig. 6) is similar to that found in each season and shows a peak near 80 m/sec.

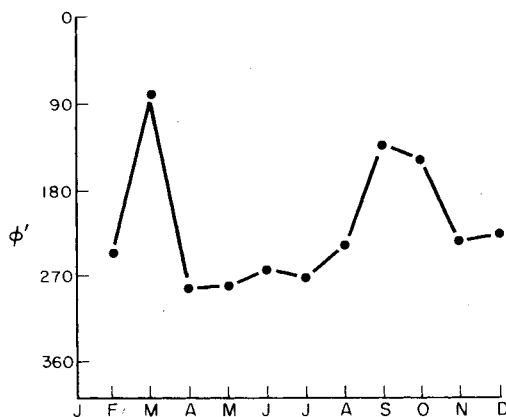


FIG. 4.

An analysis of the times of maximum drift velocity towards the four cardinal points for all months shows well marked peaks. These occur at the following hours:

	UT	LMT
north $+ v'_y$	0300	0100
east $+ v'_x$	0800	0600
south $- v'_y$	1300	1100
west $- v'_x$	0000	2200

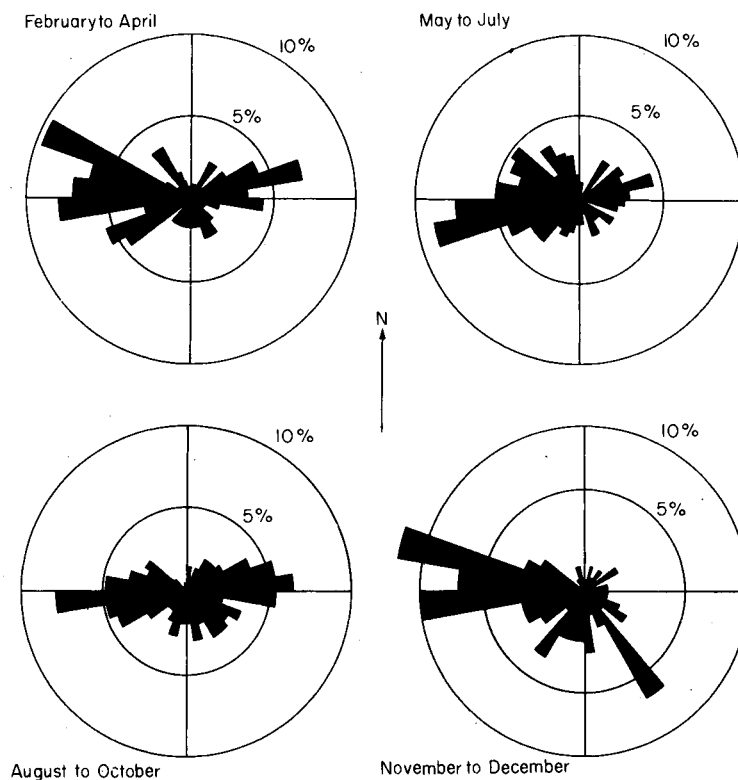


FIG. 5.

Therefore, it is probable that the diurnal component of velocity contains a clockwise rotating vector throughout the year.

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TABLE 1. Relation between Φ' (similar fades) and Φ (full analysis)

Φ'	Φ	Φ'	Φ	Φ'	Φ	Φ'	Φ
Degrees							
0	0	90	90	180	180	270	270
15	5	105	131	195	185	285	311
30	10	120	152	210	190	300	332
45	17	135	163	225	197	315	343
60	28	150	170	240	208	330	350
75	49	165	175	255	229	345	355

TABLE 2. *E*-region drift velocities: Three-hourly running median values of v'_x , v'_y , v' , Φ' and v , Φ for the four seasons of 1958

season	hour UT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
autumn Feb.-April	parameter																								
	$v'_x(E)$	-84	-83	-84	-87	+40	+166	+86	+50	+79	+73	+72	+54	+45	+30	+30	+30	+8	+35	+37	+92	+53	-138	-158	-139
	$v'_y(N)$	+2	+19	+12	+12	+39	+28	+68	+38	+48	-1	-14	-32	+19	+44	-3	+104	-3	-30	-44	-32	-32	+2	+23	+2
	v'	84	85	85	88	56	168	110	63	92	73	73	63	49	53	30	103	9	46	58	97	62	138	160	139
	Φ'	271	283	278	278	46	80	52	53	59	91	101	127	67	34	96	16	111	134	150	109	121	271	278	271
	count	6	9	9	5	2	3	4	6	7	10	9	11	9	9	5	5	5	7	10	11	7	5	5	5
	Φ	84	92	89	91	63	178	128	74	108	74	78	67	57	57	31	111	9	52	61	105	62	138	167	139
winter May-July	$v'_x(E)$	-126	-92	-116	-43	-30	+69	-70	-70	-123	+351	-34	-38	-49	-50	-64	-67	-59	+7	+9	-13	-35	-86	-86	-117
	$v'_y(N)$	+85	+54	+25	+56	+56	+60	+41	+27	+17	+131	+82	+82	+15	+15	+19	+44	+31	+24	+34	+39	+37	-32	-32	+92
	v'	152	106	119	71	64	91	81	75	124	375	90	90	51	52	67	80	67	25	35	41	51	92	92	149
	Φ'	304	300	282	322	332	49	300	291	278	70	337	335	287	287	303	287	303	298	16	15	342	317	250	312
	count	6	7	10	16	16	14	9	7	3	2	5	5	7	7	12	11	11	10	12	12	11	10	6	7
	Φ	179	124	129	78	67	105	96	87	129	429	108	108	58	59	75	83	78	26	36	42	57	106	106	170
	ϕ	336	331	305	349	350	19	332	321	294	41	353	352	314	314	314	334	329	5	4	354	344	220	220	341
spring Aug.-Oct.	$v'_x(E)$	-172	+37	-18	+57	+12	+28	+41	+59	+42	+62	+60	+64	+61	+61	+50	+46	+38	+41	+56	+56	+50	-136	-164	-172
	$v'_y(N)$	-53	+118	+186	+84	+67	+58	+62	-18	-25	-19	-10	-2	-2	0	+2	+4	-13	-20	-31	-22	-27	-42	-58	-73
	v'	180	124	187	86	68	64	74	62	67	65	61	64	61	61	50	46	40	46	64	60	57	142	174	187
	Φ'	253	17	354	42	10	26	33	107	112	107	99	92	92	90	88	85	109	116	119	111	118	253	251	247
	count	7	6	9	8	11	13	11	10	19	32	45	46	46	51	52	47	44	54	33	22	16	9	9	3
	Φ	203	127	188	97	69	67	79	70	69	73	65	65	61	61	50	47	46	54	75	70	67	160	198	222
	ϕ	225	5	358	15	3	9	12	136	125	135	118	98	98	90	85	75	138	148	151	142	150	226	222	214
summer Nov.-Dec.	$v'_x(E)$	-41	-41	-38	-23	+24	+29	+28	+7	+24	+33	+38	+38	+29	+23	+21	+18	+23	+28	+39	+50	+54	+59	+56	+46
	$v'_y(N)$	-1	+10	+4	0	-31	-40	-47	-54	-39	-19	-18	-25	-31	-28	-18	-20	-22	-34	-37	-34	-26	-10	-8	-2
	v'	41	42	38	23	39	49	63	54	46	39	42	38	39	35	26	34	36	52	62	64	64	57	47	26
	Φ'	269	284	276	270	142	144	154	173	148	120	115	131	143	143	135	126	128	131	126	122	114	100	100	266
	count	45	46	42	43	47	51	50	51	57	52	47	47	42	41	52	50	47	38	36	43	44	50	46	44
	Φ	41	46	39	24	43	53	66	55	46	46	49	43	43	38	29	40	42	40	72	76	75	60	50	26
	ϕ	267	309	289	270	166	167	171	178	169	152	147	160	167	167	163	157	158	161	157	154	145	119	119	258

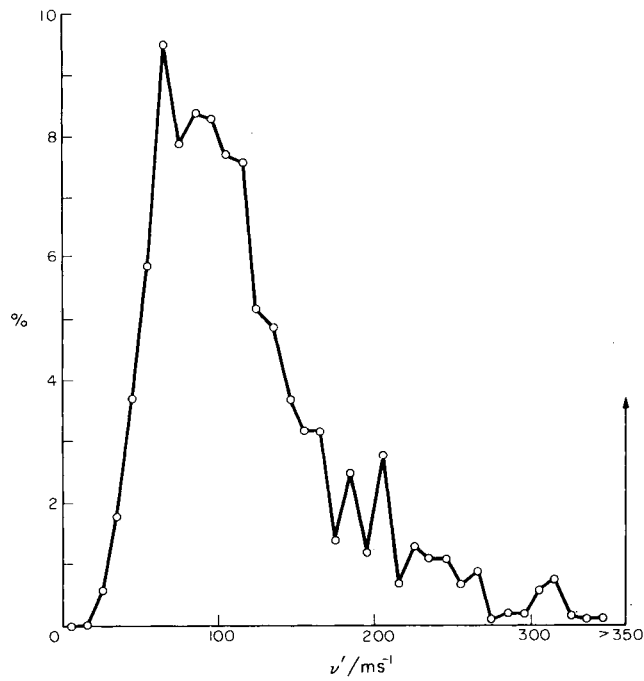


FIG. 6.

TABLE 4. E-region drift speeds and magnetic activity index Q .

Q	v' (m/s)			Median v'	Number of observations
	<85	85 to 170	>170		
	%	%	%	m/s	
0-1	84	9	7	65	75
2-3	63	27	10	75	79
4-5	46	31	23	80	13

4.8. IONOSPHERIC DRIFTS MEASURED BY THE RADIO STAR SCINTILLATION TECHNIQUE

H. J. A. CHIVERS.*

DURING the IGY, regular drift observations were made on 80 MHz from Jodrell Bank with three stations spaced by about 1 km. The Cygnus (19N4A) radio source was observed for at least several days each month when near lower culmination. Scintillation of the source was always present for a period of about 5 h centered on lower culmination regardless of the time of day at which the observations had to be made¹. Thus the situation was different from that in the 1954 measurements when the source was observed at high elevations only and scintillations were only present at night.

In the course of the 18 months of the IGY, 627 determinations of drift motion were made. The drift directions are plotted in histogram form in Fig. 1 where the angles refer to the direction which the irregularities were approaching. It can be seen that most of the directions measured came within the range of directions expected assuming the

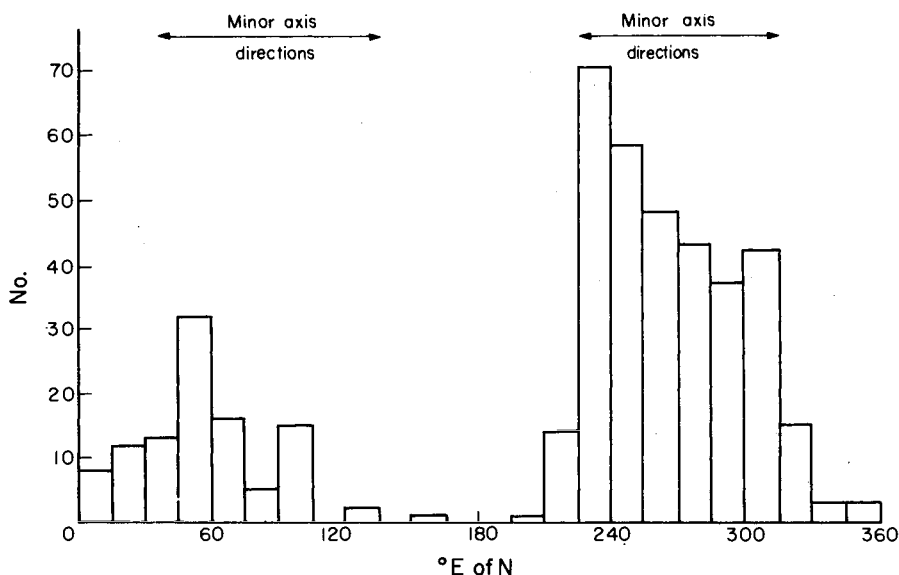


FIG. 1.

* Nuffield Radio Astronomy Laboratories, Jodrell Bank, University of Manchester, United Kingdom. Full publication see I. 3 (c) (i), p. 4.

irregularities are elongated along the magnetic field direction². The drift speeds measured are shown in Fig. 2. The values observed ranged from 50 to 3700 m/sec and it can be seen from the histogram that the most common speed was between 200 and 300 m/sec.

To examine the "reversal" problem, the percentage of westerly drifts for each hour of the average solar day has been determined. In order to weight the percentages obtained according to the number of determinations in each hour, a 4h- weighted running mean has been determined and is shown by the solid line in Fig. 3(a). It can be seen that near 1800 UT, 96 per cent of the measured drifts were in a westerly direction, and that this value falls steadily to reach a minimum of 42 per cent at 03.00 UT. On this evidence, drifts would be in a westerly direction almost every day and there would be just over a 50 per cent probability of a reversal in direction occurring during the night hours.

During actual observing periods, which usually lasted for several hours, sudden reversals were sometimes recorded, but these were few compared with the total number of vectors measured. Accordingly, to examine the diurnal distribution of reversals the diurnal distribution of westerly vectors has been used in the following way. A smooth curve has been fitted to the experimental points by harmonic analysis, and if y is the percentage of westerly drifts, and t is the time in hours, the equation obtained can be written:

$$y = 74.5 - 19.0 \sin 15^\circ(t/h + 0.5) - 6.0 \sin 30^\circ(t/h + 0.07) + 3.0 \sin 45^\circ(t/h + 2.0)$$

including terms to the third harmonic only. Since the amplitude of the third harmonic curve is about the same as the probable error in the experimental value of y , it is not considered significant. The calculated points using terms to the second harmonic are

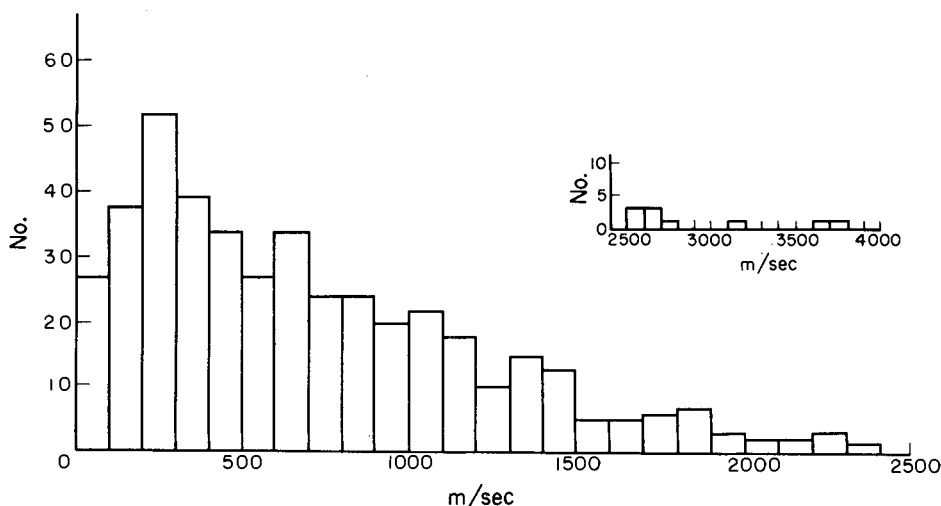


FIG. 2.

plotted in Fig. 3(a) and are connected by the dashed line. Since the best estimate of the most probable time for the occurrence of a reversal is the time at which this curve has the greatest slope, its first differential has been derived and is reproduced in Fig. 3(b). The

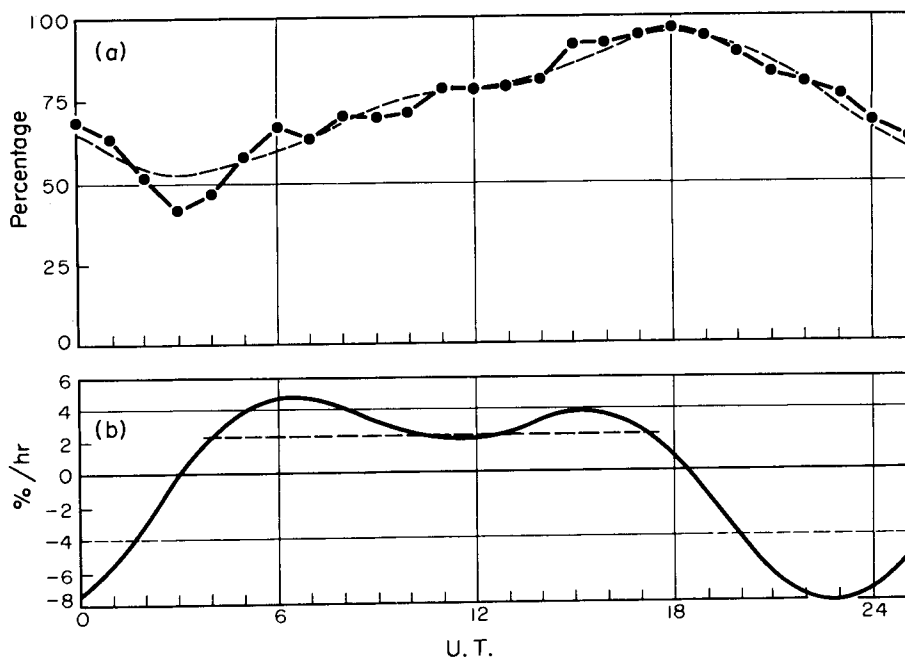


FIG. 3.

differential has a distinct negative value at 23.00 h but the two positive maxima are not so distinctive. It can be seen that the half amplitude width of the negative excursion is 6 h while that of the positive excursion is 14 h. The interpretation of this curve is that the most probable time for the observation of a reversal from westerly to easterly drifting is near 23.00 h but that there is no definite time for the occurrence of the complementary reversal.

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4.9. SEASONAL AND LATITUDE VARIATIONS OF NOON BEARINGS OF E-REGION DRIFTS

L. HENDERSON,*

BRIGGS and SPENCER¹ have compared noon values of the E-W component of E region drift velocity at Cambridge and Wellington (Lower Hutt). The seasonal variation averaged over four years at Cambridge was sinusoidal, being towards the east in summer and the west in winter. Only eight months' data were then available from Lower Hutt, and they confirmed that at least in summer the two hemispheres had strong components to the east in middle latitudes. BRIGGS and SPENCER drew the then reasonable deduction that the seasonal variation was the same at both stations.

Examination of further Lower Hutt noon data shows that the E-W component does not have a simple sinusoidal variation with season. In fact, during six years of observations covering the extreme range of solar activity (1952-58), it has shown a consistent trend to the east in both winter and summer, and to the west in the equinoxes. We note that the Cambridge curves for early afternoon (Fig. 11 of BRIGGS and SPENCER,¹) show a similar trend, although the annual cycle mentioned above predominates near noon.

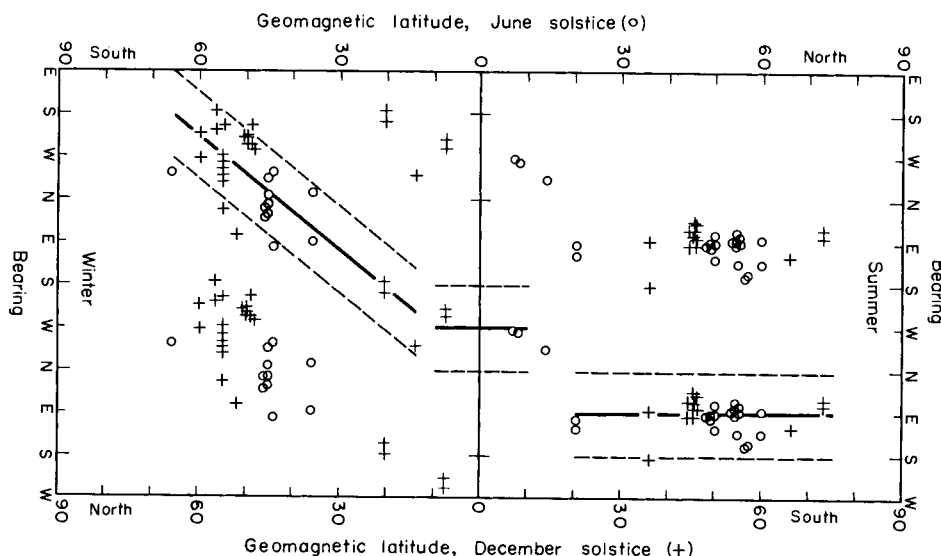


FIG. 1. Variation of E-region noon bearings with geomagnetic latitude. o data for June solstice (left ordinate); + data for December solstice (right ordinate). Note: the bearings scale covers a range of more than two cycles, so that each point is plotted at least twice.

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In the simple MITRA² method of deriving drift velocities, it is well known (e. g. YERG³), that the speeds are seriously overestimated when random motions form a significant part of the drift velocity. Although most of the affected data have been eliminated by inspection, it is thought that some of the residual scatter in E-W components may be due to this effect. For the purpose of this note, attention is confined to a study of drift bearings, which appear to be more precisely defined.⁴

A seasonal plot of bearings at Cambridge and Wellington confirmed the common trend to the east in summer and the different behaviour in winter. Results from some other stations suggested that there might be a latitude effect in winter. This hypothesis has been tested by examining average summer and winter noon bearings derived from all published data, together with some provided by private communication. These data were plotted against geographic, geomagnetic and dip latitudes. The summer plots were very similar in all three cases. For the winter results, the spread of bearings versus geographic latitude was such that no mean trend could readily be discerned. However, the distributions versus geomagnetic and dip latitudes showed significantly less spread, and both varied in a similar manner. It was thus apparent that some magnetic latitude control was present, but on the available data there was no clear discrimination between the

TABLE 1. List of drift stations and the period of observations for data shown in Fig. 1.

Station	Geomag. Lat (°)	Year	No. of points		Source of data
			Sum	Wint.	
Kjeller	N 60	1953-5	2	2	HARANG and PEDERSEN ⁵
Jodrell Bank	N 56½	1953-5	2	2	GREENHOW and NEUFELD ^{6,7}
Cambridge	N 55	1949-58	7	7	BRIGGS and SPENCER ¹ BRIGGS†
State College	N 52	1951-2	0	1	MILLMAN ⁸
Freiburg	N 50*	1955-9	3	5	HARNISCHMACHER and RAWER ^{9,10} RAWER†
Washington	N 49*	1950-3	3	3	SALZBERG and GREENSTONE ¹¹ BRIGGS and SPENCER ¹
Yamagawa	N 20½	1957-8	2	2	TSUKAMOTO and OGATA ¹² SHIMAZAKI ¹³
Ahmedabad	N 14	1956-7	1	1	SETHURAMAN ¹⁴
Waltair	N 7½	1957-8	2	2	RAO and RAO ^{15,16}
Brisbane	S 36	1952-4	2	2	BURKE and JENKINSON ¹⁷
Adelaide	S 44½*	1952-4	2	2	ELFORD ¹⁸
Wellington	S 45½	1952-8	6	6	
Halley Bay	S 66	1958	1	1	BELLCHAMBERS and PIGGOTT ¹⁹
Mawson	S 73	1957-9	2	0	ELFORD and MURRAY ²⁰

* Values adjusted by about half a degree so that data from different stations can be distinguished in Fig. 1.

† Data provided by private communication.

local and the dipole field effects. Fig. 1 shows the distribution of noon bearings in summer and winter versus geomagnetic latitude. The observing stations and sources of data are listed in Table 1.

In the case of observations by the meteor trails method (Adelaide, Jodrell Bank, Mawson), the bearings were derived from the published Fourier series. Where these were given for several height ranges only the upper region, centred on 100 km, was used.

Figure 1 has been so drawn that observations for both hemispheres are superimposed according to season, but have separate symbols. Each point represents the average bearing for one season, the years covered being as listed in Table 1. A few points are based on only one month's observations. The linked pairs of points for Yamagawa show values for the same data treated by slightly different methods (TSUKAMOTO and OGATA¹², SHIMAZAKI¹³.)

Full lines, described below, indicate the probable variation with latitude and season. Broken lines, drawn at 90° to either side, are inserted merely to facilitate estimation of the spread of data.

The major novel feature of Fig. 1 is that in *winter*, over the latitude range 14..66°, there is a steady change of bearing with latitude. The straight line fitted by the method of least squares is defined by

$$\Phi = 710^\circ - 8\lambda_m$$

where Φ is the drift bearing in degrees E of N
and λ_m is the geomagnetic latitude.

The same group of data, when plotted against magnetic dip latitude, cover a latitude range 20..60°, and the least squares line is given by

$$\Phi = 835^\circ - 11\lambda_d$$

These lines are not greatly different over middle latitudes.

The Cambridge and Wellington data suggested a possible variation of winter bearings with sunspot number, with Φ decreasing by about 25° for an increase in sunspot number of 100. However, application of this adjustment to the above group of data did not materially reduce the spread.

Other notable features of Fig. 1 are as follows:

1. The data for both hemispheres are in reasonable agreement for the two seasons;
2. The summer trend to the east holds over the geomagnetic latitude range 20..75°;
3. There is a sudden transition to the west near the subsolar point;
4. The equatorial region has a westerly drift in both summer and winter.

Acknowledgements

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4.10 INTERCOMPARISON OF INSTANTANEOUS DRIFT DATA

K. RAWER

NEARLY all results presented in this volume are concerned with a period of at least one month and are presented in the form of a statistical description. In section B we have insisted that periods have been chosen of a length so that the data could be considered statistically "significant". It is, of course, not less important to look for individual values. One of the aims of drift observations during the IGY was to obtain data in such quantities that it would be reasonably possible to compare individual observations at different stations. Unfortunately this goal has not been reached. There are a few days where many stations have been observing but for most stations the number of observations is not large enough to be significant. Under these circumstances it seemed preferable to compare individual values at all observing stations during a few of the "Meteorological World Intervals"; these were periods of 10 days intended for drift observations and it is very probable that most stations made observations on at least a few of these days. Two of these intervals, viz., June 15–24 and December 12–21 1958, have been chosen because of the number of observing stations and the quality of their results. For the original graphs we used different colours, one for each day, but we were unable to find any obvious relations between the parameters measured. We therefore decided to reproduce all observed points for a given period without any distinction, except the layer from which the echo was obtained. The relevant data were taken from those existing at WDC-C1.

The data presented have all been obtained with the three-antennae fading method as introduced by KRAUTKRÄMER in 1942. According to the IGY recommendations, each point of the following figures corresponds to the median or average obtained with all fades which occurred during a period of the order of 10 min. The data are presented in polar coordinates and as a function of the hour from the indications given in the WDC material. The following table gives the stations with their geographical coordinates and the time system used. The U.S.S.R. stations probably used legal time, i.e., the next multiple of 15° in longitude. Stations are in alphabetic order on the table, but the graphs are arranged in the order of geographical latitude (see order number on the table). There are only three Southern hemisphere stations.

Whilst in principle all stations used the same method, details of the application were considerably different. This is particularly true for the frequency used. In most countries a few fixed frequencies were used, normally the frequency was chosen so that the echo was in the desired virtual height range. This means for example that *E*-region data obtained at night have often been observed on a lower frequency than the daytime data. However, this is not true everywhere because some stations used the same frequency throughout; in these cases the number of *E*-region observations is considerably lower at night. Similarly for the *F*-region data; here many of the stations which used a rather low frequency have only night data because the reflection was from the *E*-region during the day. A more sophisticated system was used at most Soviet stations, where the frequency was individually chosen so that it was in a certain ratio with the critical frequency; this is particularly important for the interpretation of *F*-region observations where f_oF2 was used as the leading parameter. Using this system the chance of having approximately constant reflection height independent on the variations of f_oF2 is improved. In order to give an idea, the range of frequencies used is indicated on each of the graphs.

It should be emphasized that night-time *E*-region data are necessarily obtained from *E*_s-echoes whilst most (but not all) of the day time data are obtained from normal *E* (at least

on frequencies below 4 MHz). If there is a relation between the occurrence of *E*s and drift data, the night time observations presented here should have a certain bias by selection after *E*s-occurrence.

The results are presented in Figs. 1-4; 1 and 2 are concerned with the June period, 3 and 4 with December 1958. Figures 1 and 3 are for *E*-region, 2 and 4 for *F*-regions echoes. It seemed important to give an idea of the variability and dispersion of drift data, just as summary papers necessarily have a tendency to insist on regularities. It is quite clear from the figures that isolated observations are not very helpful. At stations which have at least a few days of observations, dense enough in time, we may recognize some statistical regularity, particularly in respect of direction. (It is known from general considerations that the direction is more accurately defined at fading observations than is the drift amplitude.) In some locations a constant average direction appears, in others the tidal variation (from *E* through *S* to *W*) appears clearly. However, there are cases where the individual data seem to show the contrary.

It is quite clear that large irregular variations are present in the data. Some of these are probably due to experimental uncertainty. In fact the data presented are statistical medians

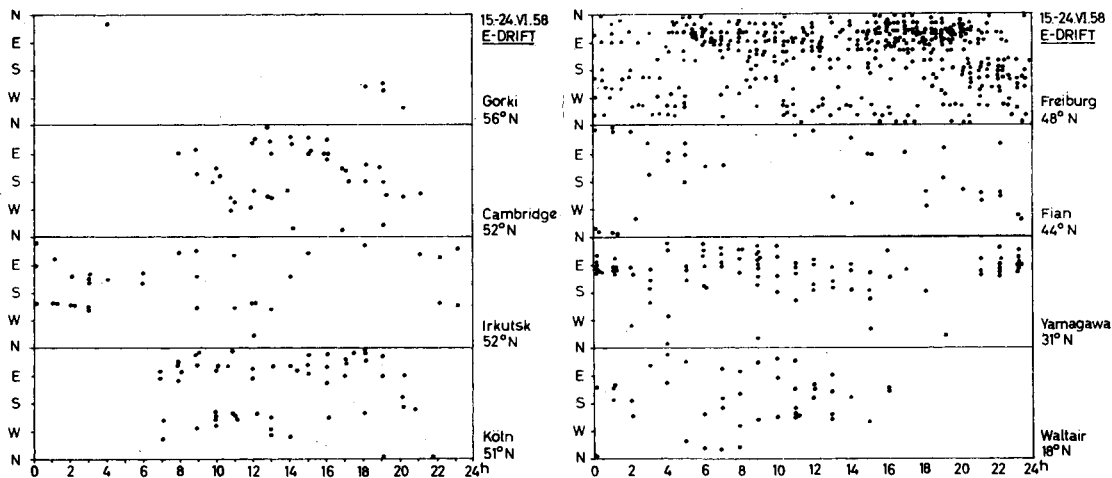


FIG. 1. June 15—24, 1958. E-Drift, direction.

or averages of a rather small number of individual fades which themselves have a large dispersion, due to the irregularity of the pattern.

On the other hand there is little doubt that important physical variations and fluctuations also occur. We should only mention here one important fact: variability of the reflection height, particularly when fixed frequencies are used. So even if the region of reflection is well defined it is not so with the specific level. As wind shears have been observed with other techniques, it is evident that changes in the ionization profile must produce equivalent changes of the height, which our techniques are sufficiently sensitive to measure. (Normally the reflection is obtained from a level where a rather steep vertical gradient exists so that the waves are seriously influenced by irregularities only at the reflection level). These height changes are partly regular (with the hour, season, etc.) partly irregular. Most of the irregularities are clearly shown by our figures.

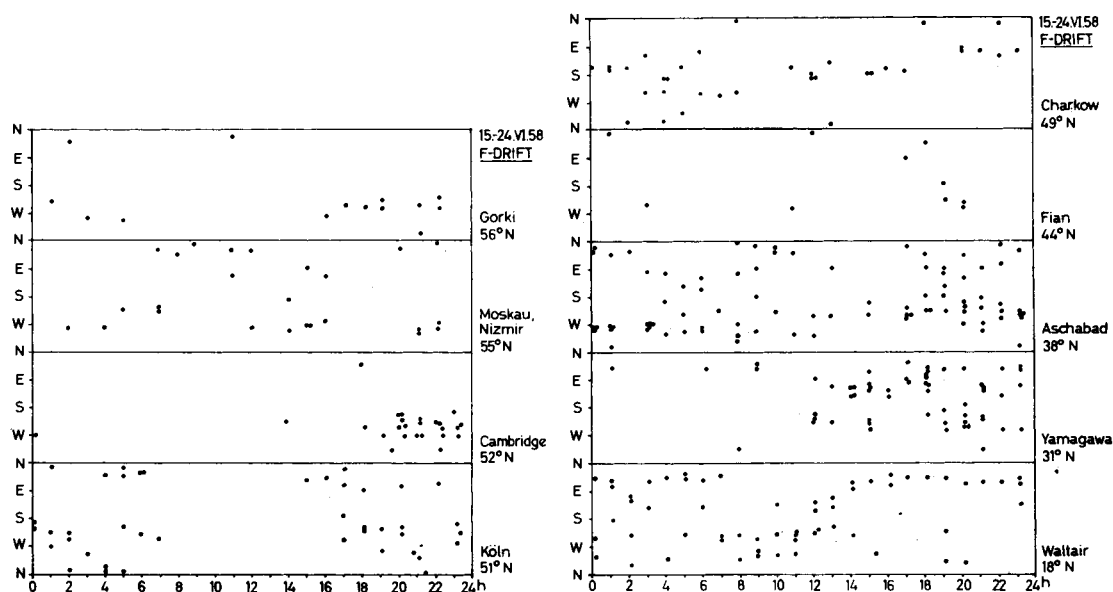


FIG. 2. June 15—24, 1958. F-Drift, direction.

The main conclusions to be drawn are the following:

1. The definition of reported regular variations depends on the statistical weight of the underlying data.
2. The total number of future observations should be considerably higher than that made by most stations during the IGY in order to obtain significant results.
3. In the future the irregular features of drift behaviour should be studied in addition to the regular ones.

Order No.	Station	Lat.	Long.	Time meridian
13	Ašhabad	37°55'N	58°18'E	
16	Brisbane	27°S	153°E	150°E
7	Cambridge	52°12'N	0°06'E	0°
9	Har'kov	49°26'N	36°55'E	
12	Fian	44°24'N	33°59'E	
10	Freiburg	48°06'N	07°48'E	15°E
3	Gor'kij	56°04'N	44°17'E	
18	Halley Bay	75°31'S	26°36'W	0°
6	Irkutsk	52°28'N	104°02'E	
8	Köln	50°56'N	6°55'E	15°E
1	Loparskaja	68°38'N	33°16,5'E	30°E
5	Moskva, NIZMIR	55°28'N	37°19'E	
4	Moskva, Leninberge	55°42'N	37°33'E	
11	Rostov	47°13'N	39°39'E	
2	Tomsk	56°28'N	84°56'E	
15	Waltair	17°43'N	83°18'E	0°
17	Wellington	41°14'S	174°55'E	172,5°
14	Yamagawa	31°12,5'N	130°37,7'E	135°E

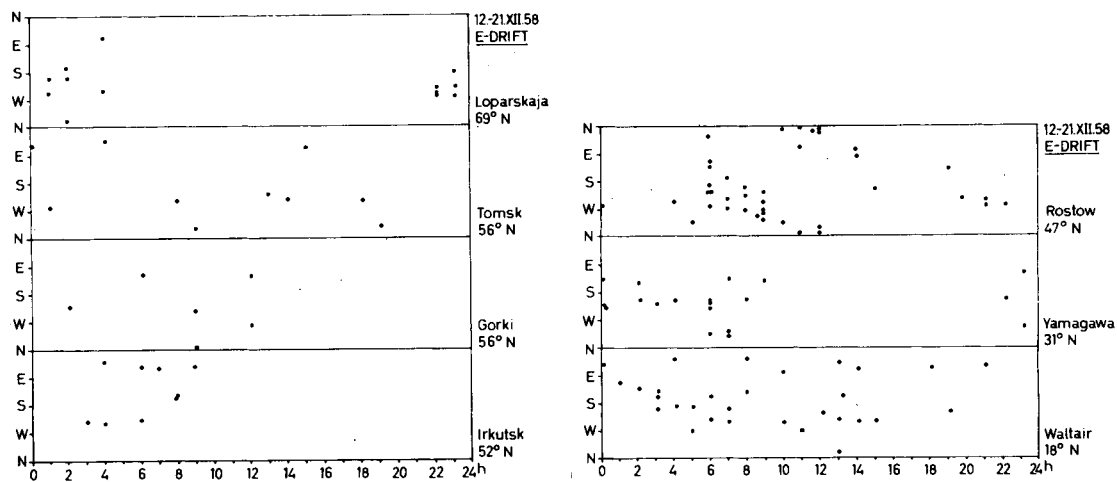


FIG. 3. Dec. 12—21, 1958. E-Drift, direction.

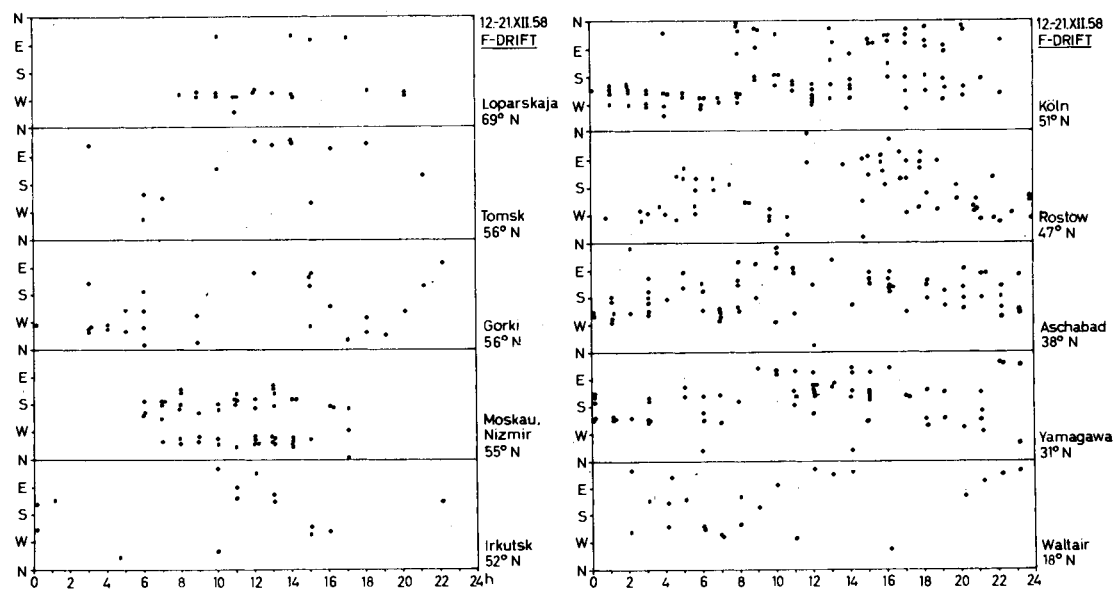


FIG. 4. Dec. 12—21, 1958. F-Drift, direction.