CLIMATOLOGICAL DATA

for the

SOUNDING ROCKET STATION AT NATAL

(Barreira do Inferno)

Report LAFE-35

This report has been prepared
with the colaboration of the
Diretoria de Rotas Aéreas
Ministério da Aeronáutica

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Conselho Nacional de Pesquisas
Comissão Nacional de Atividades Espaciais (G.O.)
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São José dos Campos
São Paulo - Brasil

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NOTE

The series of climatological tables and graphs presented herein are based on 10 years (1954 - 1963) of weather observations at Natal Brazilian Air Force Base (05°54'S and 35° 15'W). The raw data was furnished by the "Diretoria de Rotas Aéreas" of the Ministério da Aeronáutica. The data reduction for the tables was performed at CNAE by U. Belcufine (1 Ten Met) of GTEPE, Manuel C. de Moura (S.O. Met.) and Liraucio Bonaz (1 S Met) of the Serviço de Rotas (SR-4), 4ª Zona Aérea - M. Aer. - São Paulo. We gratefully acknowledge all their collaboration.

The tables on this report appear in a similar order of presentation on the United Nations Doc. A/AC. 105/10 (Committee on the Peaceful Uses of Outer Space): "Manual Prepared by the INCOSPAR on the Thumba Equatorial Sounding Rocket Launching Site" (India). Thus it will be easy to compare the climatological informations on both launching sites, namely Thumba in India and Natal - Brazil.

At a later date this preliminary report will be part of a full report being prepared about the first Brazilian Sounding Rocket Station.

Fernando de Mendonça
Scientific Director

CLIMATOLOGICAL TABLES

Station: NATAL Lat. 05° 54'S Long. 35° 15'W
Height above M.S.L. 48m
Based on observation from 1954 to 1963

TABLE I

Month		Pressure	Air Temperature			
		Mean at station level	Mean Dry Bulb.	Mean Wet Bulb.	Mean (of) Daily Max.	Mean (of) Daily Min.
	Col.	1	2	3	4	5
		mb	°C	°C	°C	°C
JAN.	I	1006.2	27.5	23.4	30.6	23.5
	II	1004.6	28.6	23.9	-	-
FEB.	I	1006.1	27.5	23.8	30.7	23.6
	II	1004.5	28.9	24.1	-	-
MAR.	I	1006.0	27.2	23.9	30.5	23.4
	II	1004.3	28.3	24.3	-	-
APR.	I	1006.0	27.0	23.8	30.1	22.8
	II	1004.3	28.1	24.2	-	-
MAY	I	1007.3	26.3	23.2	29.7	22.2
	II	1005.8	27.5	23.7	-	-
JUN.	I	1008.9	25.1	22.5	28.6	21.3
	II	1007.5	26.7	22.9	-	-
JUL.	I	1009.7	24.6	21.5	28.1	20.6
	II	1008.1	26.1	22.4	-	-
AUG.	I	1009.8	24.7	21.7	28.4	20.3
	II	1008.2	26.2	22.2	-	-
SEP.	I	1009.3	25.4	22.1	28.9	21.0
	II	1007.5	26.0	22.5	-	-
OCT.	I	1008.2	26.8	22.5	29.8	22.0
	II	1006.5	27.3	23.1	-	-
NOV.	I	1006.8	27.2	23.0	30.1	22.9
	II	1005.1	27.6	23.2	-	-
DEC.	I	1006.4	27.4	23.2	30.3	23.4
	II	1004.8	28.1	23.6	-	-
Annual Total or Mean	I	1007.5	26.3	22.8	29.6	22.2
	II	1005.9	27.4	23.3	-	-
No. of Years	I	10	10	10	10	10
	II	10	10	10	-	-

I - Morning
II - Afternoon

TABLE II

Month		Highest in the month	Lowest in the month	Highest recorded	Date and year	Lowest recorded	Date and year
	Col.	6	7	8	9	10	11
		°C	°C	°C		°C	
JAN.	I	32.0	21.6	32.9	28	20.6	12-1956
	II	-	-	-	1958	-	19-1962
FEB.	I	32.1	21.9	32.7	15	21.4	05
	II	-	-	-	1963	-	1960
MAR.	I	32.1	21.8	33.0	30	21.0	22-1957
	II	-	-	-	1954	-	07-1961
APR.	I	31.7	21.5	32.6	07	20.7	28-29
	II	-	-	-	1954	-	1956
MAY	I	31.1	20.6	31.6	08-1955	19.5	30
	II	-	-	-	03-04-1956 09-21-1957	-	1958
JUN.	I	30.4	19.8	31.0	04	19.0	20
	II	-	-	-	1957	-	1956
JUL.	I	29.8	18.9	30.7	19	17.7	26
	II	-	-	-	1960	-	1956
AUG.	I	29.8	18.6	30.4	28	17.9	12
	II	-	-	-	1963	-	1961
SEP.	I	30.4	19.0	31.4	23	17.4	21
	II	-	-	-	1956	-	1960
OCT.	I	31.0	19.9	31.7	19	19.1	12
	II	-	-	-	1959	-	1960
NOV.	I	31.3	20.0	31.8	29-1957	19.9	18
	II	-	-	-	20-1963	-	1961
DEC.	I	31.4	21.4	31.8	02-03-1957	19.8	11
	II	-	-	-	02-1954	-	1956
Annual Total or Mean	I	31.1	20.4	33.0	30-03-1954	17.4	21-09-1960
	II	-	-	-		-	
No. of Years	I	10	10	10	10	10	10
	II	-	-	-	-	-	-

I - Morning
II - Afternoon

TABLE III

Month		Humidity	Cloud Amount		Mean Wind Speed
		Relative humidity	All Clouds	Low Clouds	
	Col.	12	13	14	15
		%	Eighths of sky		Knots
JAN.	I	72	5.6	4.8	07
	II	69	4.7	3.2	08
FEB.	I	75	5.7	4.4	06
	II	66	5.1	3.1	09
MAR.	I	75	6.0	4.2	06
	II	72	5.5	3.2	07
APR.	I	78	5.7	4.0	06
	II	72	5.1	3.0	07
MAY	I	78	5.6	4.1	07
	II	72	4.9	3.1	08
JUN.	I	81	5.5	3.9	08
	II	71	4.9	3.2	08
JUL.	I	77	5.3	3.9	09
	II	74	4.7	3.1	10
AUG.	I	77	5.0	3.9	08
	II	71	4.3	3.1	10
SEP.	I	74	5.0	4.2	08
	II	74	3.7	3.0	09
OCT.	I	68	5.2	4.5	08
	II	71	3.9	3.3	09
NOV.	I	71	5.3	4.7	07
	II	69	4.3	3.4	08
DEC.	I	71	5.6	4.6	07
	II	69	4.7	3.4	08
Annual Total I		74	5.5	5.1	08
pr Mean II		71	4.7	3.8	10
No. of I		10	10	10	10
Years II		10	10	10	10

I - Morning
II - Afternoon

TABLE IV

Month		Rainfall					
		Mean monthly total	Mean number of rainy days	Total in wettest month with year	Total in driest month with year	Heaviest fall in 24 hours	Date and year
	Col.	16	17	18	19	20	21
		mm		mm	mm	mm	
JAN.	I	34.7	8.8	152.3	1.9	38.5	18
	II	-	-	1961	1962	-	1961
FEB.	I	40.3	9.8	102.5	7.1	26.4	16
	II	-	-	1961	1957	-	1962
MAR.	I	173.0	14.6	415.6	9.9	152.7	26
	II	-	-	1960	1963	-	1961
APR.	I	187.2	15.7	368.3	0	180.4	17
	II	-	-	1957	-	-	1957
MAY	I	143.2	15.4	282.8	0	139.6	13
	II	-	-	1962	-	-	1961
JUN.	I	151.6	14.9	308.8	0	73.0	25
	II	-	-	1955	-	-	1959
JUL.	I	146.8	16.8	247.4	0	103.1	29
	II	-	-	1954	-	-	1960
AUG.	I	94.3	15.9	208.3	22.4	95.5	17
	II	-	-	1955	1963	-	1956
SEP.	I	50.2	12.0	114.8	11.6	37.9	4
	II	-	-	1962	1963	-	1962
OCT.	I	24.8	8.8	78.0	6.0	32.3	23
	II	-	-	1961	1959	-	1955
NOV.	I	17.0	6.7	62.1	4.1	20.4	10
	II	-	-	1963	1955	-	1959
DEC.	I	31.1	7.1	111.1	0.2	25.6	17
	II	-	-	1957	1961	-	1963
Annual Total or Mean	I	1,094.2	146.5	1,513.7	306.4	92.5	-
	II	-	-	1960	1963	-	-
No. of Year	I	10	10	10	10	10	10
	II	10	10	10	10	-	-

I - Morning
II - Afternoon

TABLE V

Month		Weather Phenomena No. of days with Precipitation 0,1 mm or more	Thunder	Dust or Smoke	Damp Haze	Fog
	Col.	22	23	24	25	26
JAN.	I	6	0.4	0	0.6	0
	II	-	-	-	-	-
FEB.	I	7	0.5	0	0.5	0
	II	-	-	-	-	-
MAR.	I	14	1.1	0	1.0	0
	II	-	-	-	-	-
APR.	I	15	0.9	0.1	1.4	0.3
	II	-	-	-	-	-
MAY	I	15	0.1	0	1.2	0.1
	II	-	-	-	-	-
JUN.	I	16	0	0.1	1.1	0.1
	II	-	-	-	-	-
JUL.	I	17	0	0	1.0	0.1
	II	-	-	-	-	-
AUG.	I	13	0	0.3	1.3	0.1
	II	-	-	-	-	-
SEP.	I	9	0	0.6	1.7	0
	II	-	-	-	-	-
OCT.	I	6	0	0	0.6	0
	II	-	-	-	-	-
NOV.	I	4	0	0	0.3	0
	II	-	-	-	-	-
DEC.	I	4	0.1	0	0.1	0
	II	-	-	-	-	-
Annual Total or Mean	I	126	3,1	1.1	10.8	0.7
	II	-	-	-	-	-
No. of Year	I	10	10	10	10	10
	II	10	-	-	-	-

I - Morning
II - Afternoon

TABLE VI

Month		Wind (Knots)					
		No. of days with wind force					
		20 or more	15-19	10-14	5-9	1-4	0
	Col.	27	28	29	30	31	32
JAN.	I	0	0	5.2	23.9	1.8	0.1
	II	0	0	20.1	10.6	0.3	0
FEB.	I	0	0	3.5	20.0	4.5	0
	II	0	0.4	15.9	11.2	0.5	0
MAR.	I	0	0	2.4	21.9	6.5	0.2
	II	0	0.3	10.6	17.7	2.3	0.1
APR.	I	0	0	4.0	21.9	4.1	0
	II	0	0	8.3	19.1	2.5	0.1
MAY	I	0	0.1	8.7	20.7	1.5	0
	II	0	0.4	9.8	18.7	2.0	0.1
JUN.	I	0	0.2	11.2	17.5	1.1	0
	II	0	0.3	14.0	14.5	1.2	0
JUL.	I	0	0.2	16.7	13.4	0.7	0
	II	0	2.2	18.1	10.4	0.3	0
AUG.	I	0	0	12.4	11.4	0.2	0
	II	0	2.7	20.4	7.5	0.4	0
SEP.	I	0	0.1	15.2	14.6	0.1	0
	II	0	1.5	19.3	9.0	0.2	0
OCT.	I	0	0	15.8	15.1	0.1	0
	II	0	0.8	20.8	9.2	0.2	0
NOV.	I	0	0	12.2	17.2	0.6	0
	II	0	0.4	15.9	13.5	0.2	0
DEC.	I	0	0.1	8.8	21.1	1.0	0
	II	0	0	18.0	12.9	0.1	0
Annual Total or Mean	I	0	0.7	123.1	218.7	22.2	0.3
	II	0	9.0	191.2	154.3	10.2	0.3
No. of Years	I	10	10	10	10	10	10
	II	10	10	10	10	10	10

I - Morning
II - Afternoon

TABLE VII

Month		Percentage No. of days with wind from								
		N	NE	E	SE	S	SW	W	NW	Calm
	Col.	33	34	35	36	37	38	39	40	41
JAN.	I	-	1	48	23	19	2	-	-	7
	II	-	2	71	24	1	-	-	-	-
FEB.	I	-	1	45	20	20	4	-	-	10
	II	-	2	78	18	1	-	-	-	1
MAR.	I	-	2	32	22	27	6	1	1	9
	II	-	4	63	27	3	-	-	-	2
APR.	I	-	1	16	27	45	6	0	-	5
	II	-	2	39	48	8	-	-	-	3
MAY	I	-	-	12	29	51	4	-	-	3
	II	-	-	28	55	15	-	-	-	1
JUN.	I	-	-	7	27	60	3	-	-	3
	II	-	-	13	66	18	-	-	-	2
JUL.	I	-	-	6	27	62	3	-	-	2
	II	-	-	12	67	20	-	-	-	1
AUG.	I	-	-	6	35	52	2	-	-	1
	II	-	1	11	75	13	-	-	-	-
SEP.	I	-	-	18	39	38	1	-	-	2
	II	-	-	24	68	7	-	-	-	-
OCT.	I	-	1	35	41	21	-	-	-	2
	II	-	1	43	54	2	-	-	-	-
NOV.	I	-	4	56	24	10	1	-	-	5
	II	-	4	67	28	1	-	-	-	-
DEC.	I	-	2	58	23	11	1	-	-	5
	II	-	1	77	21	-	-	-	-	-
Annual Total or Mean	I	-	1	28	28	35	3	-	-	5
	II	-	1	44	46	7	-	-	-	1
No. of Years	I	10	10	10	10	10	10	10	10	10
	II	10	10	10	10	10	10	10	10	10

I - Morning
II - Afternoon

TABLE VIII

Month		Cloud							
		No. of days with cloud amount (All clouds)				No. of days with Low cloud amount (eighths)			
		0-2	3-4	5-6	7-8	0-2	3-4	5-6	7-8
	Col.	42	43	44	45	46	47	48	49
JAN.	I	1	8	14	8	3	16	11	1
	II	0	5	15	11	1	9	18	3
	III	5	10	8	8	9	16	6	0
FEB.	I	1	7	11	9	3	16	8	1
	II	0	4	13	11	1	8	16	3
	III	3	8	8	9	9	14	5	0
MAR.	I	1	7	10	13	6	17	7	1
	II	0	3	12	16	1	10	18	2
	III	3	7	8	13	10	15	5	1
APR.	I	3	7	8	12	9	13	7	1
	II	1	4	12	13	1	10	16	3
	III	4	8	7	11	10	14	5	1
MAY	I	4	8	8	11	12	12	5	2
	II	0	5	13	13	1	10	16	4
	III	5	8	8	10	13	12	6	0
JUN.	I	5	7	7	11	11	10	6	3
	II	1	5	10	14	2	9	16	3
	III	5	8	6	11	11	11	7	1
JUL.	I	5	8	7	11	11	11	7	2
	II	1	6	12	12	2	11	16	2
	III	7	7	8	9	12	11	7	1
AUG.	I	7	8	8	8	11	12	6	2
	II	1	6	14	10	2	9	18	2
	III	7	9	8	7	11	11	8	1
SEP.	I	3	11	10	6	7	14	7	2
	II	1	7	15	7	1	9	17	3
	III	8	12	6	4	10	14	6	0
OCT.	I	1	10	14	6	3	18	9	1
	II	0	8	17	6	1	11	17	2
	III	6	14	9	2	9	14	8	0
NOV.	I	0	8	16	6	2	17	10	1
	II	0	6	17	7	1	9	17	3
	III	4	11	11	4	7	14	9	0
DEC.	I	1	7	13	10	2	16	11	2
	II	0	5	17	9	1	8	20	2
	III	4	9	12	6	8	15	8	0
Annual Total or Mean	I	32	96	126	111	80	172	93	19
	II	5	64	167	129	15	113	205	32
	III	61	111	99	94	119	161	80	5
No. of Years	I	10	10	10	10	-	-	-	-
	II	-	-	-	-	10	10	10	10

I - 0800/1100
II - 1200/1600
III - 1700/2100

TABLE IX

Month		Visibility (in km)			
		No. of days with visibility limited to			
		Up to 1	1-5	5-10	Over 10
	Col.	50	51	52	53
JAN.	I	0	0	0.1	30.9
	II	0	0	0.2	30.8
FEB.	I	0	0	0.3	27.7
	II	0	0	0.3	27.7
MAR.	I	0	0.3	1.0	29.7
	II	0	0.1	0.5	30.4
APR.	I	0	0.1	1.2	28.7
	II	0.	0.4	0.7	28.9
MAY	I	0	0.2	1.7	29.1
	II	0	0.3	0.7	30.0
JUN.	I	0	0.3	2.1	27.6
	II	0	0.5	1.0	28.5
JUL.	I	0	0.9	1.7	28.4
	II	0	0.1	0.9	30.0
AUG.	I	0	0.4	1.4	29.2
	II	0	0.1	1.0	29.9
SEP.	I	0	0	1.1	28.9
	II	0	0	0.2	29.8
OCT.	I	0	0	0.1	30.9
	II	0	0	0	31.0
NOV.	I	0	0	0.1	29.9
	II	0	0	0	30.0
DEC.	I	0	0	0.2	29.8
	II	0	0	0.1	29.9
Annual Total or Mean	I	0	2.2	11.0	350.8
	II	0	1.5	5.6	356.9
No. of Years	I	10	10	10	10
	II	10	10	10	10

I - Morning
II - Afternoon

TABLE X

MEAN RELATIVE HUMIDITY MAX. AND MIN.
(%)

Year	JAN.		FEB.		MAR.		APR.		MAY		JUN.	
	MX	MN	MX	MN	MX	MN	MX	MN	MX	MN	MX	MN
Col. 54	55	56	57	58	59	60	61	62	63	64	65	66
1954	89	58	90	58	91	58	93	59	96	64	97	63
1955	89	58	89	61	93	66	96	66	95	63	95	66
1956	89	57	96	63	94	63	95	62	95	65	95	64
1957	82	60	87	57	94	64	97	71	94	63	95	63
1958	91	59	91	59	90	58	95	59	96	64	96	64
1959	90	61	92	59	95	59	96	65	96	66	97	69
1960	89	59	90	59	95	68	95	66	95	62	96	68
1961	91	62	95	64	96	66	96	67	95	66	95	64
1962	88	57	90	59	94	62	96	64	96	66	96	66
1963	87	59	93	62	96	67	97	66	94	62	96	66
Mean	89	59	91	60	94	63	96	65	95	64	96	65

TABLE XI

MEAN RELATIVE HUMIDITY MAX. AND MIN.
(%)

Year	JUL.		AUG.		SEP.		OCT.		NOV.		DEC.	
	MX	MN	MX	MN	MX	MN	MX	MN	MX	MN	MX	MN
Col. 67	68	69	70	71	72	73	74	75	76	77	78	79
1954	96	65	95	57	94	58	91	54	87	57	87	54
1955	96	66	96	63	93	59	92	62	88	60	87	60
1956	96	65	94	63	93	57	90	56	87	56	87	55
1957	96	63	94	60	92	57	89	55	90	58	90	63
1958	97	67	96	61	92	60	89	56	89	56	90	62
1959	95	64	96	67	94	63	87	57	87	57	86	58
1960	94	62	94	60	95	61	90	58	88	58	91	57
1961	96	63	94	59	94	61	93	60	90	58	88	60
1962	97	64	95	62	95	62	92	58	92	56	90	59
1963	95	65	96	60	93	56	92	55	92	60	93	63
Mean	96	64	95	61	94	59	91	57	89	58	89	59

TABLE XII

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : January

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	14%					1					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	1	-	-	2	4	2	-	-	2	4	2	-	-
E	7	9	3	-	-	2	25	14	-	-	3	28	14	-	-
ESE	5	8	1	-	-	1	23	11	-	-	3	25	10	-	-
SE	3	3	-	-	-	1	6	2	-	-	1	5	2	-	-
SSE	7	6	-	-	-	1	3	1	-	-	-	1	-	-	-
S	15	9	-	-	-	-	1	-	-	-	-	-	-	-	-
SSW	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XIII

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : February

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	21					2					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	1	2	-	-	-	1	3	1	-	-	-	3	-	-	-
E	5	6	-	-	-	5	28	13	-	-	7	33	13	-	-
ESE	5	3	-	-	-	3	16	9	-	-	3	21	10	-	-
SE	3	2	-	-	-	2	5	3	-	-	1	4	3	-	-
SSE	8	4	-	-	-	2	3	1	-	-	-	1	1	-	-
S	16	10	-	-	-	1	2	-	-	-	-	-	-	-	-
SSW	9	3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XIV

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : March

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	18					3					2				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
NE	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-
ENE	-	-	-	-	-	1	2	-	-	-	1	3	1	-	-
E	4	4	-	-	-	4	24	7	-	-	5	29	7	-	-
ESE	2	4	-	-	-	4	18	4	-	-	7	22	5	-	-
SE	3	2	-	-	-	2	7	3	-	-	2	5	2	-	-
SSE	6	5	-	-	-	3	7	2	-	-	2	3	1	-	-
S	19	9	-	-	-	2	4	1	-	-	1	-	-	-	-
SSW	13	5	-	-	-	1	-	-	-	-	-	-	-	-	-
SW	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XV

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : April

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	11					3					2				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
ENE	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-
E	1	1	-	-	-	3	11	3	-	-	6	17	5	-	-
ESE	1	1	-	-	-	4	14	6	-	-	8	18	3	-	-
SE	1	-	-	-	-	3	10	4	-	-	4	11	4	-	-
SSE	5	7	-	-	-	4	14	5	-	-	3	9	4	-	-
S	25	22	2	-	-	3	9	3	-	-	1	2	-	-	-
SSW	13	6	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XVI

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : May

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	4					0					1				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	1	-	-	-	-	2	5	2	-	-	4	10	2	-	-
ESE	-	-	-	-	-	3	13	4	-	-	5	20	2	-	-
SE	-	1	-	-	-	2	11	5	-	-	4	16	5	1	-
SSE	5	7	1	-	-	2	17	11	1	-	3	13	7	-	-
S	23	27	10	-	-	2	9	8	1	-	1	4	2	-	-
SSW	10	8	1	-	-	-	1	1	-	-	-	-	-	-	-
SW	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XVII

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : June

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	5					1					1				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
E	1	1	-	-	-	1	3	2	-	-	2	5	1	-	-
ESE	-	-	-	-	-	2	6	4	-	-	4	10	3	-	-
SE	-	1	-	-	-	2	9	6	-	-	4	16	9	1	-
SSE	13	8	1	-	-	2	20	13	1	-	4	21	12	1	-
S	22	32	4	-	-	2	13	10	2	-	1	4	1	-	-
SSW	9	8	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XVIII

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : July

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	4					1					1				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	1	-	-	-	-	4	2	-	-	1	4	1	-	-
ESE	-	-	-	-	-	1	6	3	-	-	2	12	4	-	-
SE	1	-	-	-	-	1	8	8	-	-	2	16	11	2	-
SSE	4	9	2	-	-	2	14	22	3	-	2	15	18	3	-
S	18	38	6	-	-	1	10	12	2	-	1	3	2	-	-
SSW	8	6	2	-	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XIX

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : August

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	4					0					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	-	-	-	1	3	1	-	-	-	3	2	-	-
ESE	-	1	-	-	-	1	9	5	-	-	2	10	12	1	-
SE	1	1	-	-	-	1	9	10	1	-	2	16	12	1	-
SSE	3	10	3	-	-	1	15	25	3	-	2	14	17	3	-
S	19	39	8	-	-	1	5	8	1	-	1	1	1	-	-
SSW	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XX

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : September

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	5					0					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	1	2	-	-	-	1	7	5	-	-	1	8	4	-	-
ESE	3	6	1	-	-	2	14	12	-	-	4	19	8	-	-
SE	1	3	1	-	-	1	10	12	1	-	1	18	12	1	-
SSE	5	10	2	-	-	1	9	16	2	-	1	9	12	1	-
S	24	26	5	-	-	-	2	4	1	-	-	-	1	-	-
SSW	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XXI

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : October

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	5					0					0				
knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-
E	4	7	2	-	-	1	12	13	-	-	3	16	7	-	-
ESE	5	11	2	-	-	1	18	17	1	-	3	23	11	-	-
SE	3	8	2	-	-	1	8	9	1	1	1	12	10	1	-
SSE	6	10	1	-	-	1	5	7	1	-	1	6	5	-	-
S	18	13	1	-	-	-	1	1	-	-	-	-	-	-	-
SSW	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XXII

Percentage frequencies of occurrence of surface wind speeds for selected directions

Month : November

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	11					0					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	1	-	-	-	-	-	1	1	-	-	-	1	-	-	-
ENE	1	1	-	-	-	-	4	1	-	-	-	3	1	-	-
E	9	19	3	-	-	2	23	21	-	-	4	30	12	-	-
ESE	5	13	2	-	-	2	16	16	-	-	3	23	9	-	-
SE	3	6	1	-	-	-	4	5	-	-	1	7	3	-	-
SSE	3	4	1	-	-	-	2	2	-	-	-	2	1	-	-
S	6	7	-	-	-	-	-	-	-	-	-	-	-	-	-
SSW	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XXIII

Percentage frequencies of occurrence os surface wind speeds for selected directions

Month : December

Time GMT	0800/1100					1200/1600					1700/2100				
Calm	10					0					0				
Knots	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+	2-5	6-10	11-16	17-24	25+
N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENE	1	1	-	-	-	1	3	1	-	-	-	2	1	-	-
E	10	15	4	-	-	3	29	17	-	-	4	36	15	-	-
ESE	6	13	1	-	-	1	20	14	-	-	2	22	10	-	-
SE	3	4	1	-	-	1	5	2	-	-	1	3	2	-	-
SSE	5	6	-	-	-	-	2	1	-	-	-	1	1	-	-
S	11	5	-	-	-	-	-	-	-	-	-	-	-	-	-
SSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WSW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NNW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE XXIV

AVIATION CLIMATOLOGICAL TABLES

Year from 1954 to 1959 and from 1961 to 1962

Winds

Prevailing directions and average speed (knots)
in the period 1000/1300 GMT

Altitude (m)	JAN.	FEB.	MAR.	APR.	MAY	JUN.
4200	- -	E 10	E-NE 11	NE-E 13	E-NE 11	E 13
3000	E 12	E 10	E 12	E 13	E-SE 13	E 13
2100	E 16	E-SE 13	E 13	E-SE 15	E 15	E-SE 18
1500	E 16	E-SE 14	E 15	SE-E 15	SE 19	E-SE 20
900	E-SE 18	E 16	E-SE 16	SE 19	SE 21	SE 23
600	E-SE 17	E 15	E-SE 15	SE 18	SE 20	SE 21
300	E-SE 15	E-SE 13	SE-E 12	SE 14	SE 16	SE-S 17
Surface	E/S 8	E/S 8	E/S 7	S 7	S 8	S 9

TABLE XXV

AVIATION CLIMATOLOGICAL TABLES

Year from 1954 to 1959 and from 1961 to 1962

Winds

Prevailing directions and average speed (knots)
in the period 1000/1300 GMT

Altitude (m)	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
4200	NE-E 11	E-NE 13	E 12	NE-E 9	- -	NE-SE 9
3000	NE-E 12	E-SE 11	E-SE 16	E-SE 13	E-SE 13	E 15
2100	E-SE 17	E-SE 17	E-SE 21	E-SE 17	E 17	E 16
1500	SE-E 24	SE 22	E-SE 24	E-SE 19	E 17	E 17
900	SE 24	SE 25	SE-E 20	E-SE 22	E 18	E 17
600	SE 21	SE 24	SE 20	E-SE 20	E 19	E 17
300	SE 18	SE 19	SE 18	E-SE 19	E-SE 18	E-SE 16
Surface	S-SE 10	S-SE 10	S-SE 10	E/S 9	E-SE 8	E-SE 8

TABLE XXVI

AVIATION CLIMATOLOGICAL TABLES

Year from 1954 to 1959 and from 1961 to 1962

Winds

Prevailing directions and average speed (knots)

in the evening period

Altitude (m)	JAN.	FEB.	MAR.	APR.	MAY	JUN.
4200	- -	E-SE 12	E 11	E 11	E 11	E 11
3000	E 12	E-SE 12	E-SE 11	E-SE 12	E-SE 13	E-SE 12
2100	E-SE 14	E-SE 14	E-SE 13	E-SE 15	E-SE 15	SE 16
1500	E-SE 16	E-SE 17	E-SE 13	E-SE 16	SE 17	SE 20
900	E-SE 21	E 21	E 17	E-SE 21	SE 20	SE 23
600	E-SE 20	E 20	E 17	E-SE 18	SE 20	SE 23
300	E-SE 18	E 19	E 16	E-SE 16	SE 18	SE 19
Surface	E 9	E 10	E 8	E-SE 7	SE 8	SE 8

TABLE XXVII

AVIATION CLIMATOLOGICAL TABLES

Year from 1954 to 1959 and from 1961 to 1962

Winds

Prevailing directions and average speed (Knots)
in the evening period .

Altitude (m)	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
4200	E-SE 13	E-SE 10	E-SE 8	- -	E 15	E 13
3000	E-SE 14	E-SE 13	E-SE 15	E-SE 13	E-SE 12	E 10
2100	SE 19	SE 19	E-SE 22	E-SE 16	E-SE 14	E-SE 14
1500	SE 22	SE 23	SE 23	E-SE 18	E-SE 17	E-SE 16
900	SE 24	SE 27	SE 25	E-SE 23	E 20	E 20
600	SE 23	SE 26	SE 24	E-SE 23	E 20	E 19
300	SE 20	SE 23	SE 22	E-SE 20	E 18	E 17
Surface	SE 9	SE 10	SE 10	E-SE 8	E 9	E 8

TABLE XXVIII

AVIATION CLIMATOLOGICAL TABLES

Frequencies of heights of base of low clouds above ground
(Percentage number of days).

Years - from 1954 to 1963

Altitude (m)	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
0 to 99	0	0	0	0	0	0.2	0.1	0	0	0	0	0
100 t0 299	0.2	0	0.6	1.3	1%	1.8	2.0	1.1	0.4	0	0	0
300 to 599	13	15	26.6	29.2	27.5	30.8	31.3	25.1	19.1	12.5	10.7	12.2
600 to 899	70.6	71	58.9	52.1	49	44.4	42.2	48.6	59.6	71.6	72.3	73.2
900 to 1499	0.2	0	0.2	0.1	0.5	1.1	0.5	0.4	0.5	0	0.3	0.4
1500 to 1999	0	0	0	0	0	0.2	0	0	0	0	0	14.2
No low cloud	16	14	13.7	17.3	22	21.5	23.9	24.8	20.4	15.9	16.7	

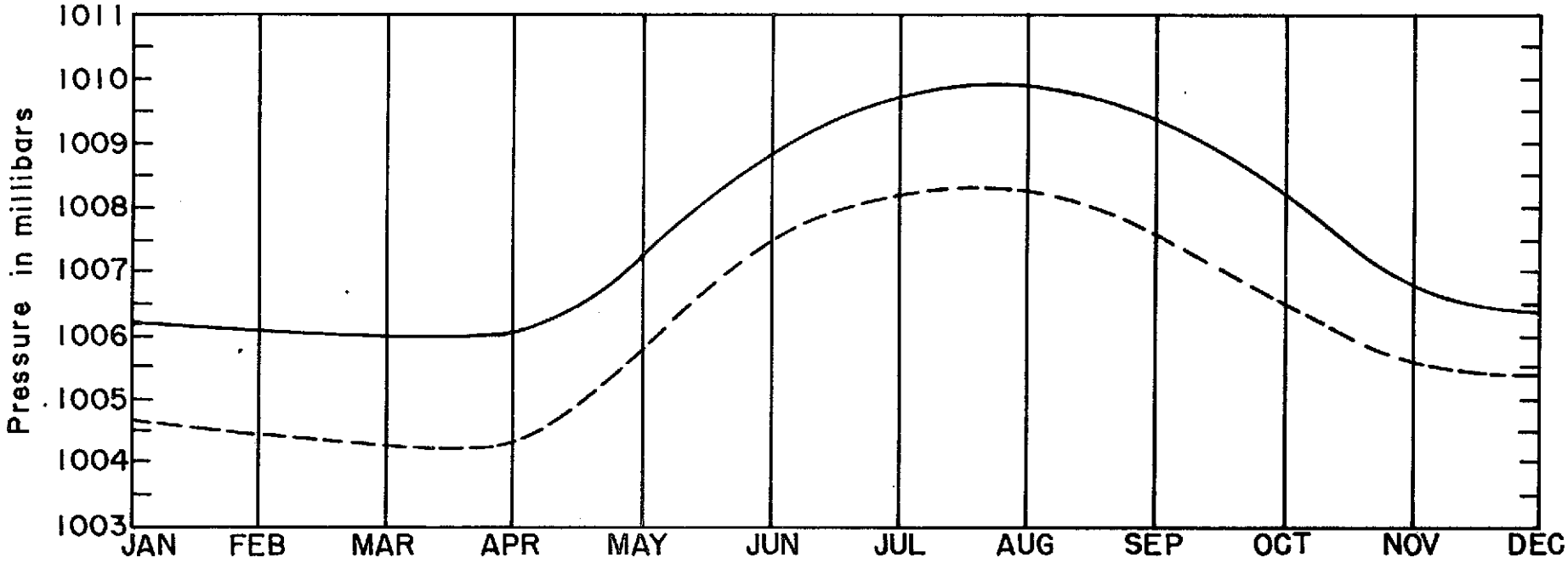

Fig. I – Mean pressure at station level

——— Morning
– – – – Afternoon } (see table I, column Nº 1)

NATAL STATION

CLIMATOLOGICAL GHAPHS

Geog. position 05° 54'S – 35° 15' W
Alt. 48 m (MSL)
All the tables were based on 10 years observations (1954 – 1963)

NATAL STATION

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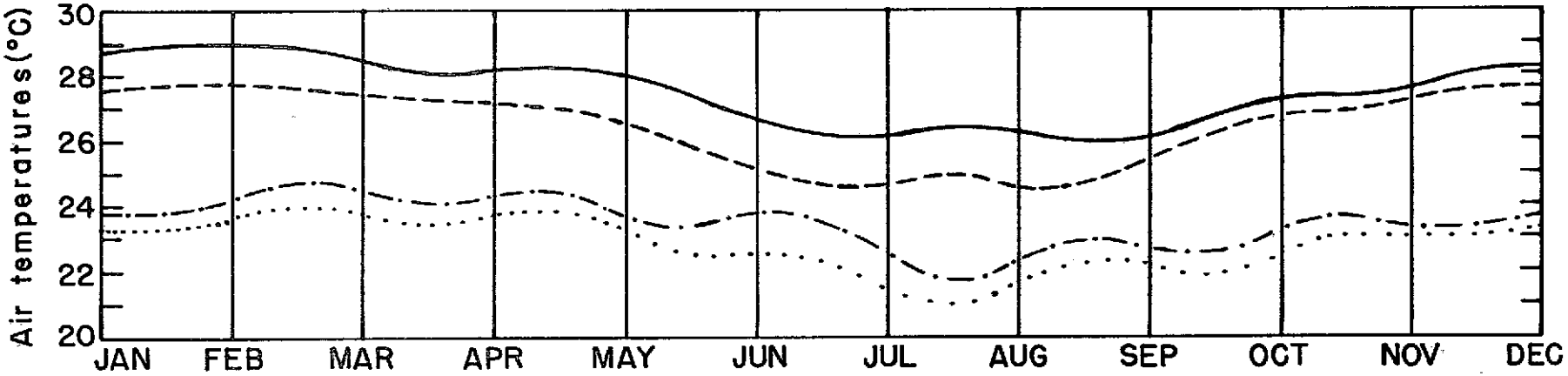

Fig. 2 — Mean air temperatures (see table I)

——— Mean dry bulb — Afternoon
– – – – Mean dry bulb — Morning
} (see tables column Nº 2)

–·–·– Mean wet bulb — Afternoon
····· Mean wet bulb — Morning
} (see tables column Nº 3)

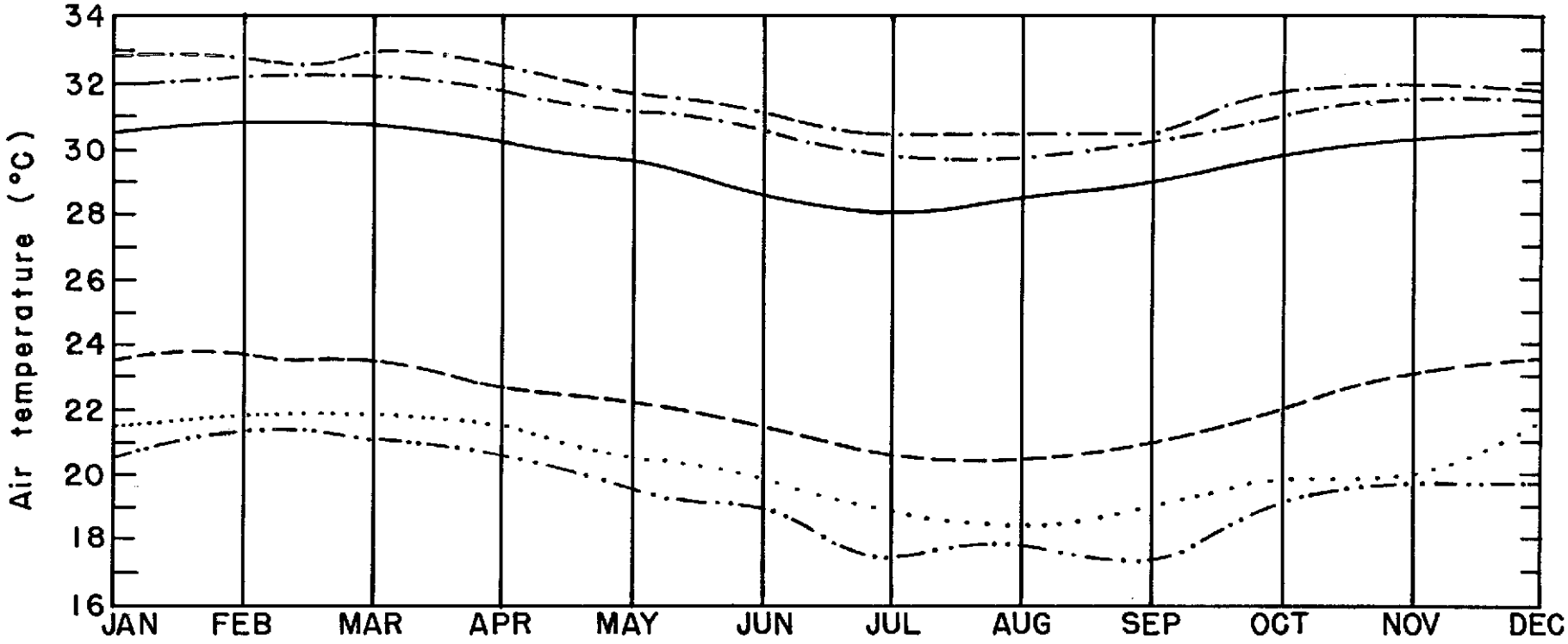

Fig.3 — Air temperatures (see tables I and II)

——— Daily maximum (see tables column Nº 4)
– – – – Daily minimum (see tables column Nº 5)
—·—·— Mean of highest in the month (see tables column Nº 6)
····· Mean of lowest in the month (see tables column Nº 7)
—·—·— Highest recorded (see tables column Nº 8)
—··—··— Lowest recorded (see tables column Nº 10)

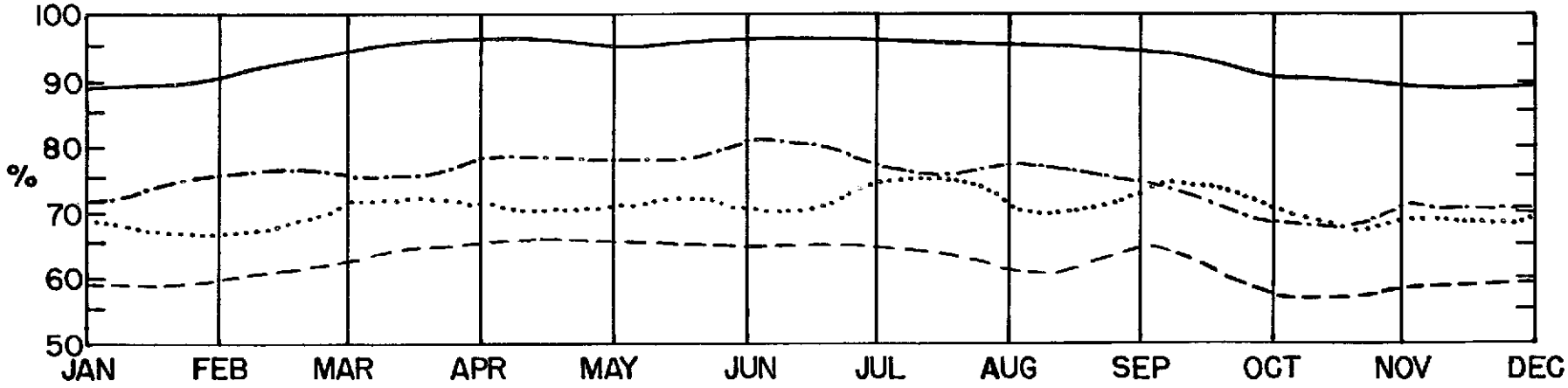

Fig - 4 Relative humidity (See table III col. 12 and table X)

——— Maximum
– – – – Minimum
MEAN RELATIVE HUMIDITY
-·-·- Morning
····· Afternoon

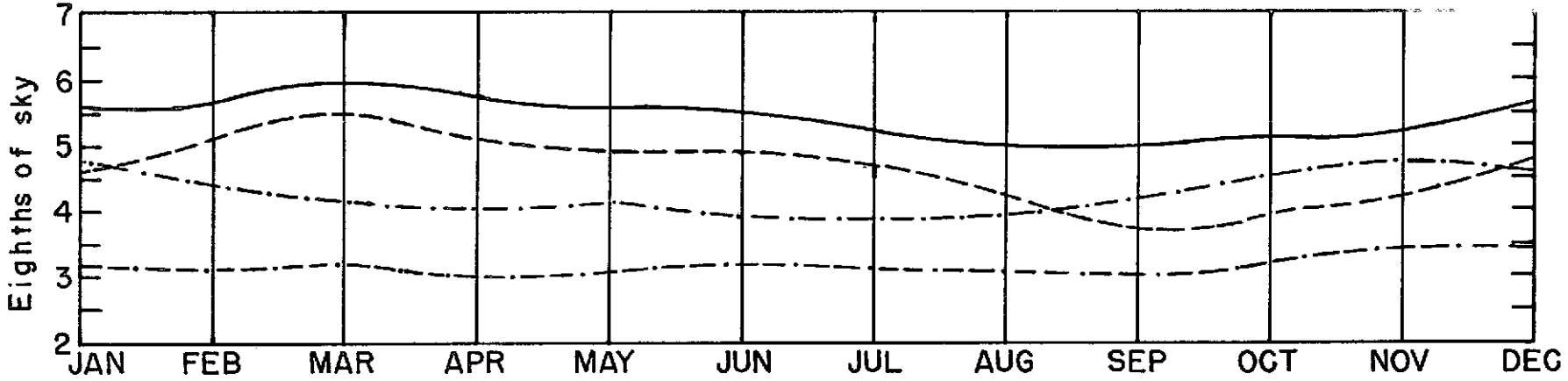

Fig. 5 – Cloud amount (see table III, columns 13 and 14)

——— Total clouds — Morning
– – – – Total clouds — Afternoon
—·—·— Low clouds — Morning
—··—··— Low clouds — Afternoon

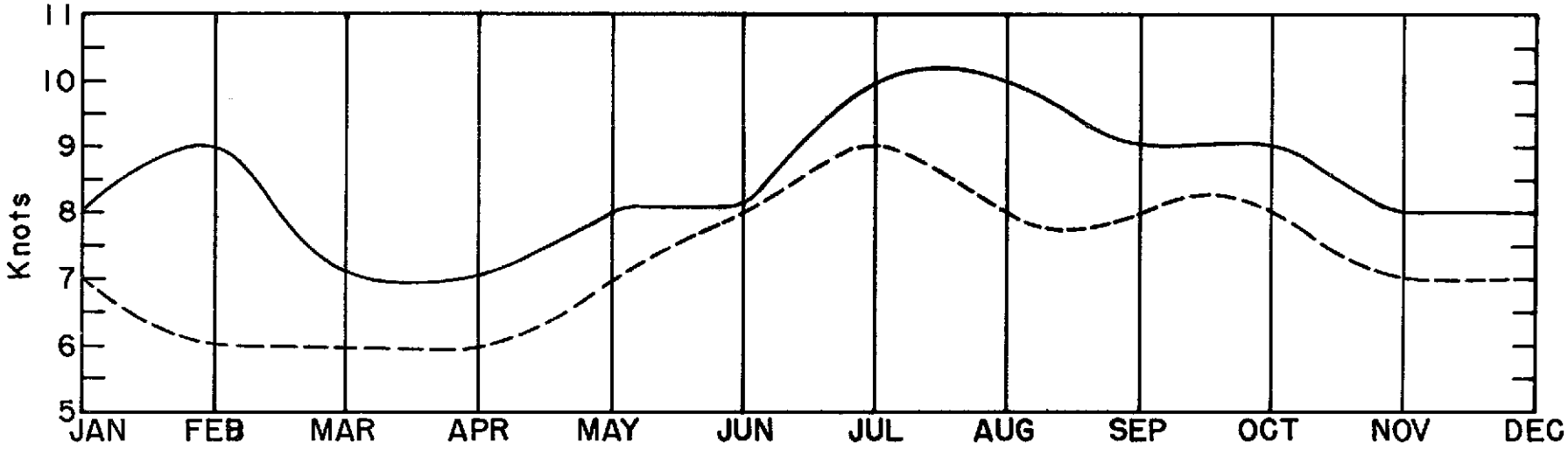

Fig. 6 — Surface wind (see table III, column 15)

– – – – Mean wind speed — Morning
——— Mean wind speed — Afternoon

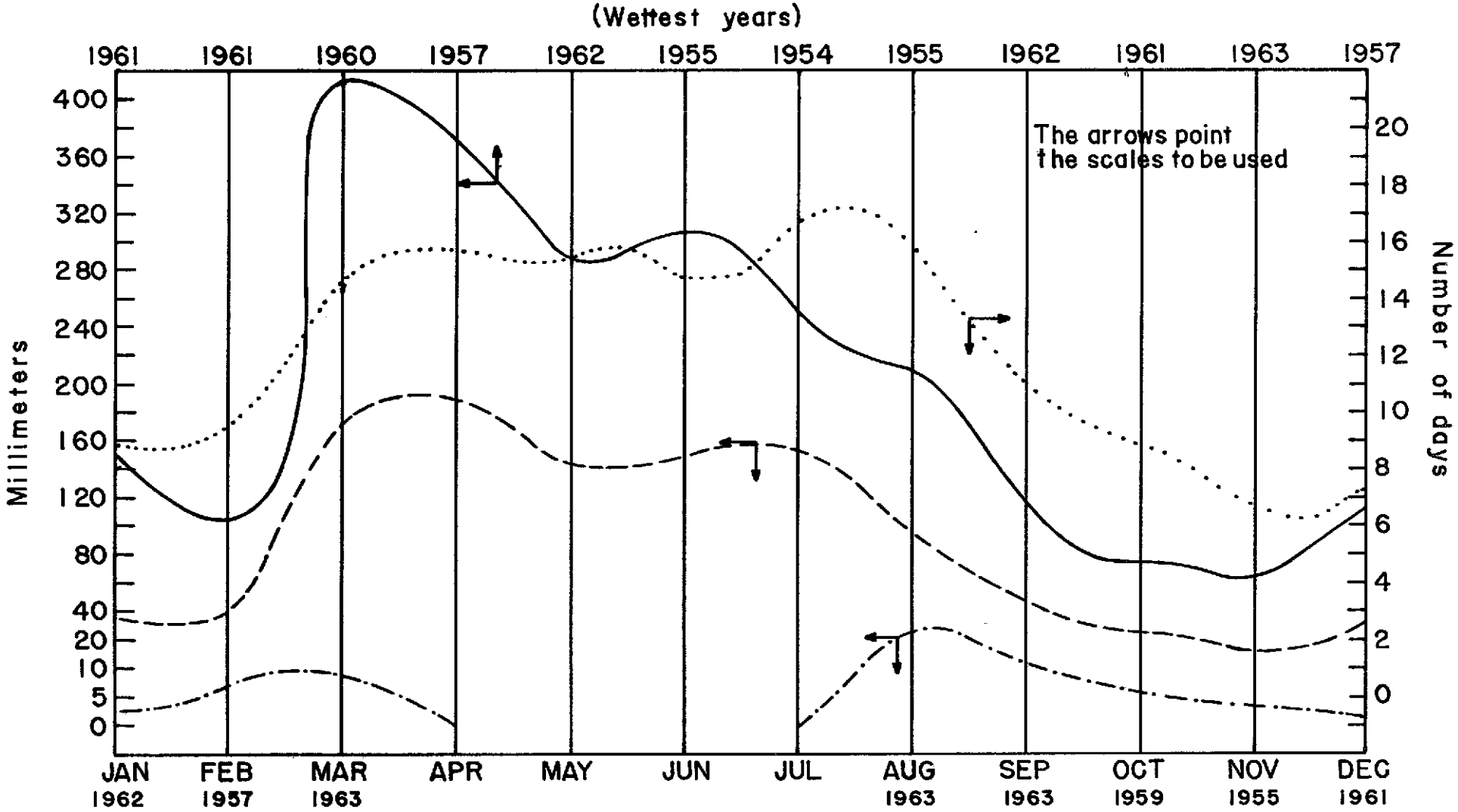

Fig.7 – Rainfall (see table IV)

——— Total rainfall – wettest month with year – column 18.
· · · · · · Mean number of rainy days – column 17.
– – – – Mean month total rainfall – column 16.
—·—·— Total rainfall – driest month with year – column 19.

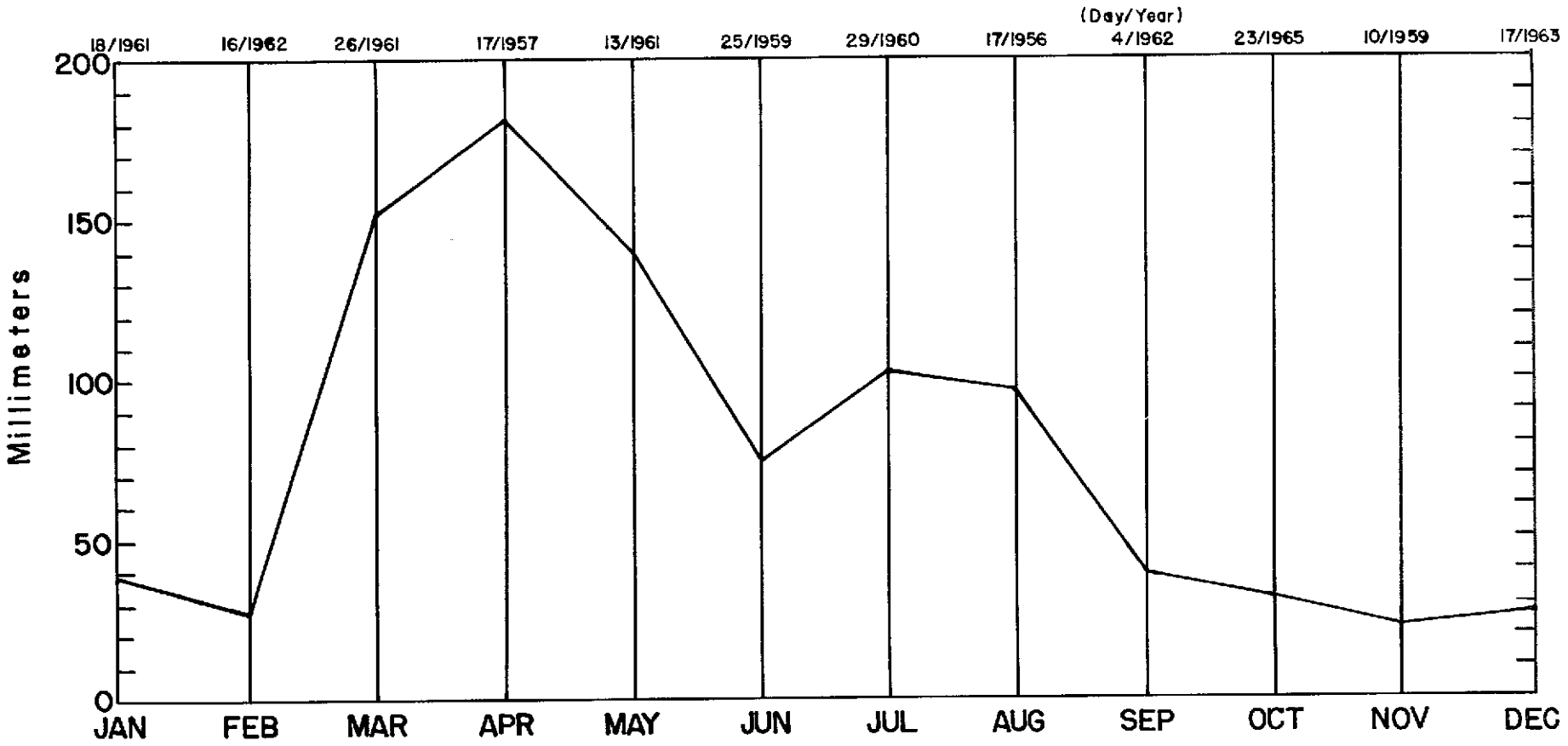

Fig. 8- Heaviest rainfall in 24 hours (See table IV, col. 20 and 21)

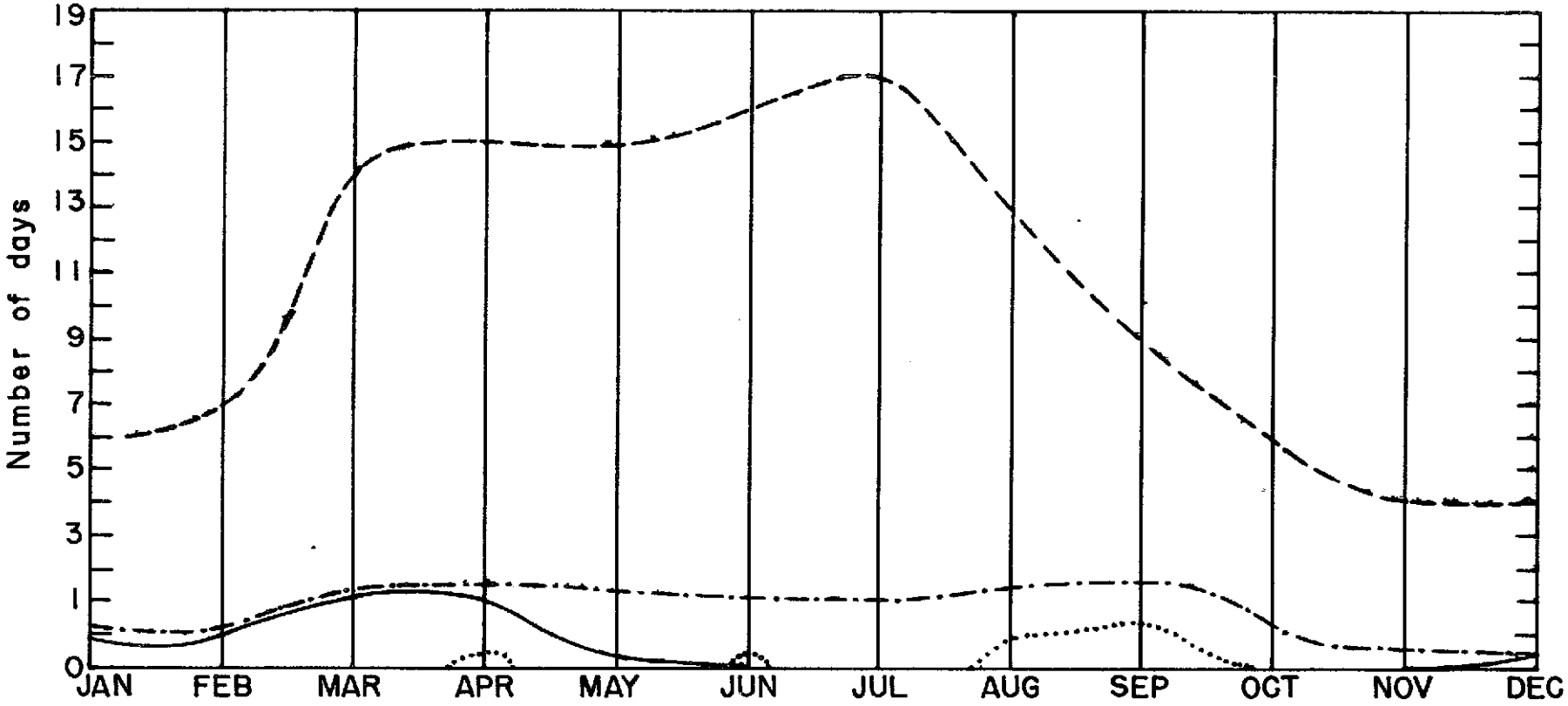

Fig. 9 – Weather phenomena (see table V)

——— Thunderstorn – column 23
– – – – Precipitation of 0.1mm or more – column 22
· · · · · · Dust, dry haze, smoke – column 24
–·–·– Damp haze – column 25

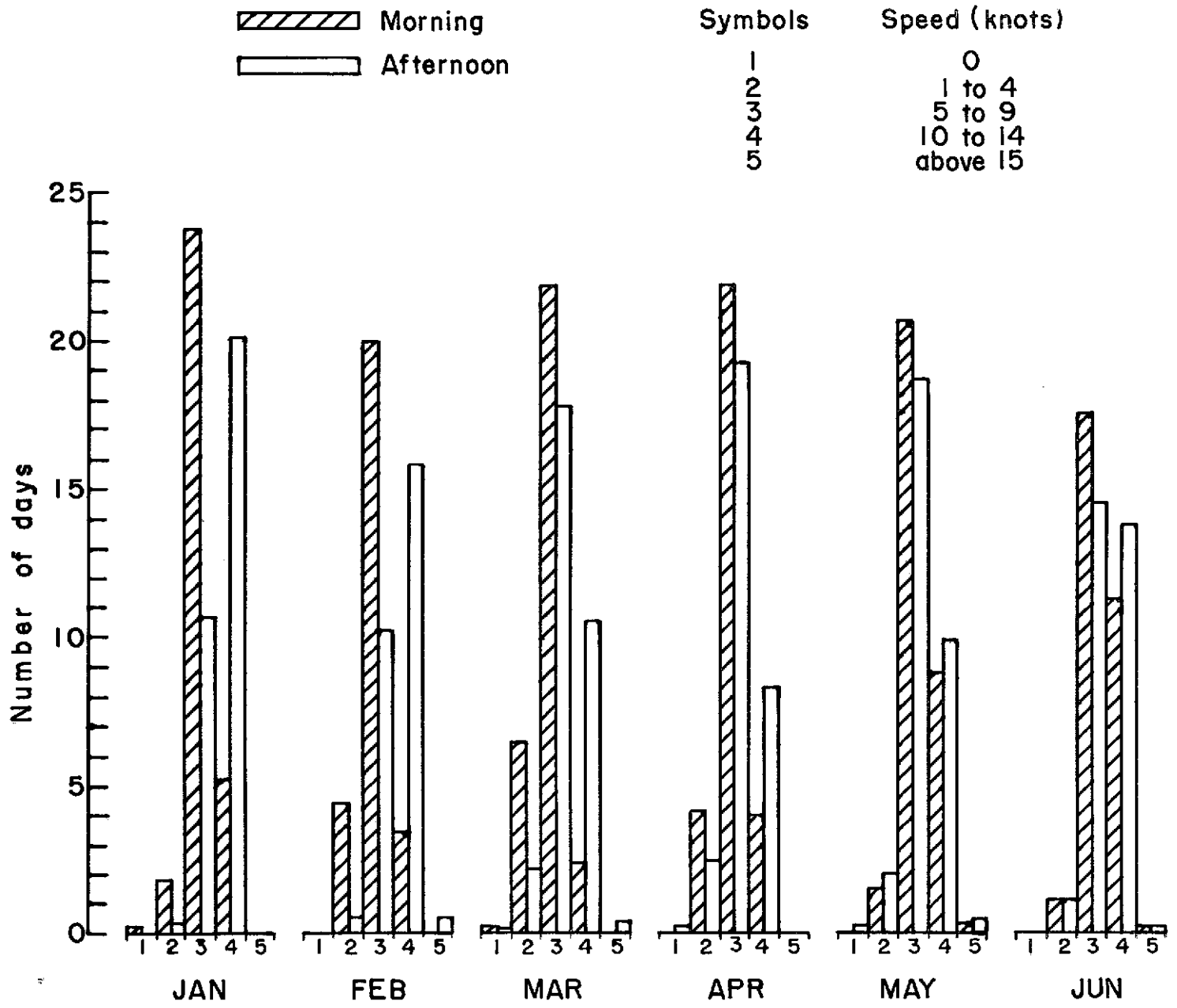

Fig. 10 — Surface wind (see table VI, columns 27 through 32)

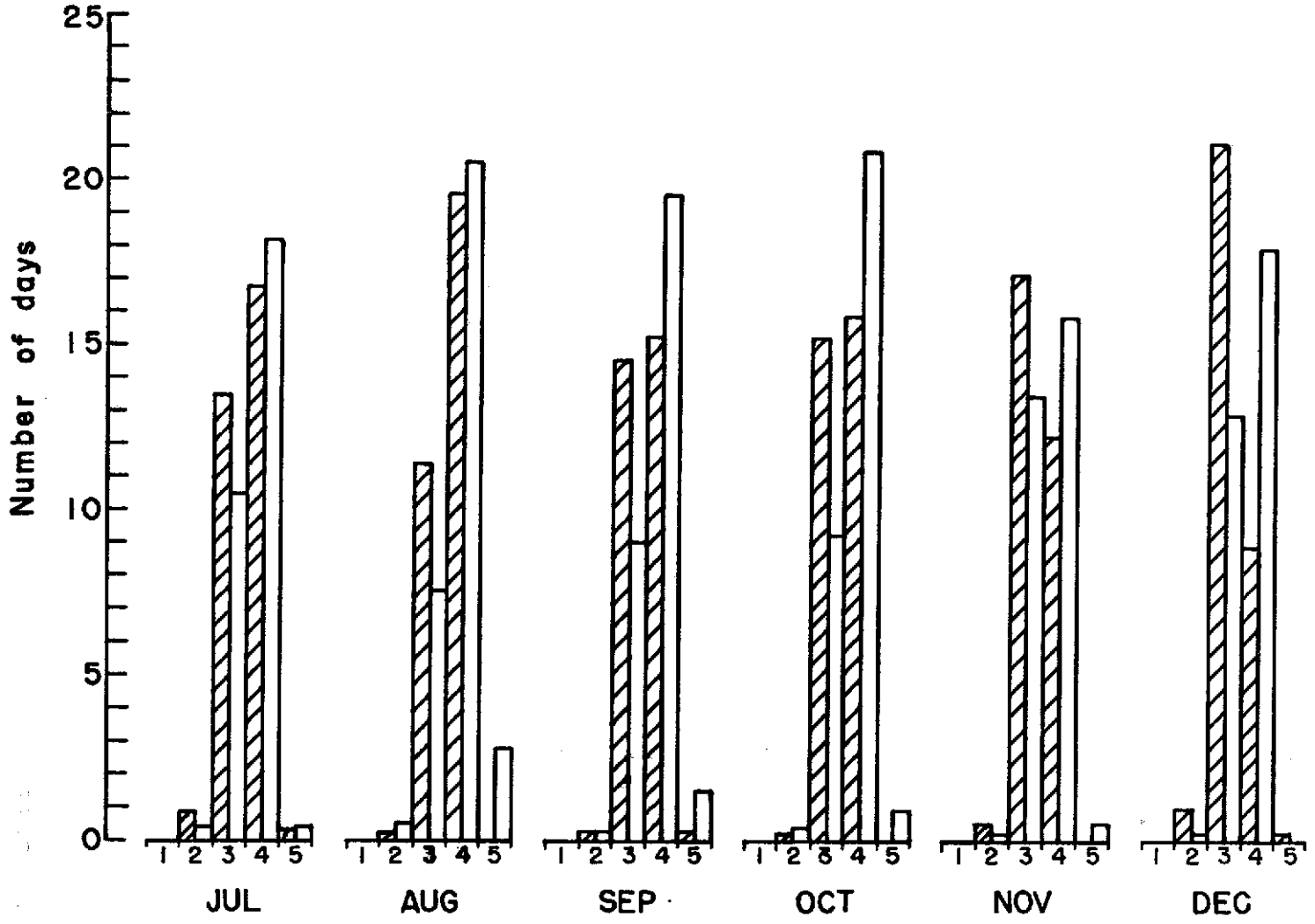

Fig. 11 – Same as Fig. 10

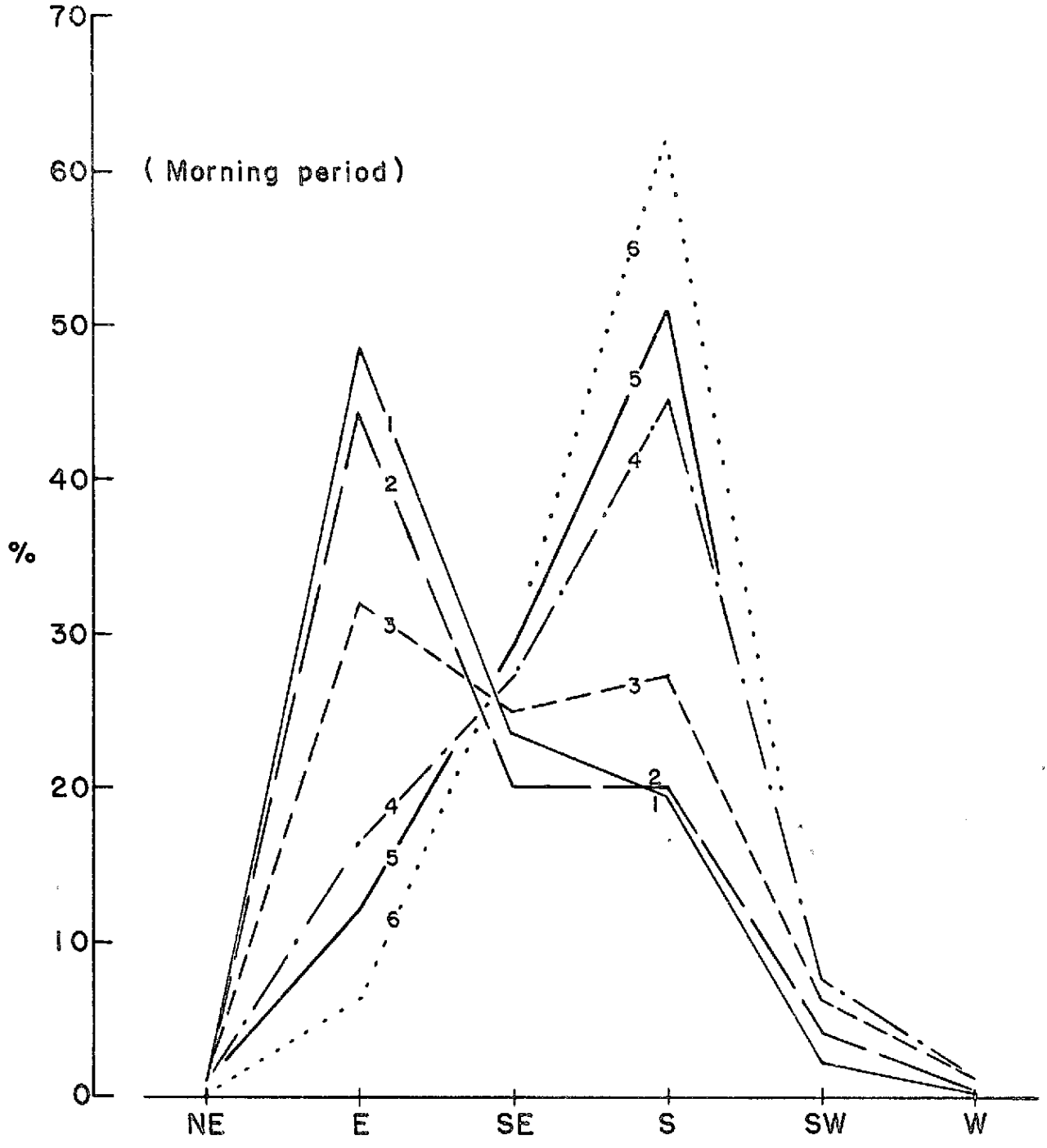

Fig.12a— Percentage of number of days with wind direction for the months Jan(1) through Jun(6). Note the clockwise rotation from month to month. (see table VII).

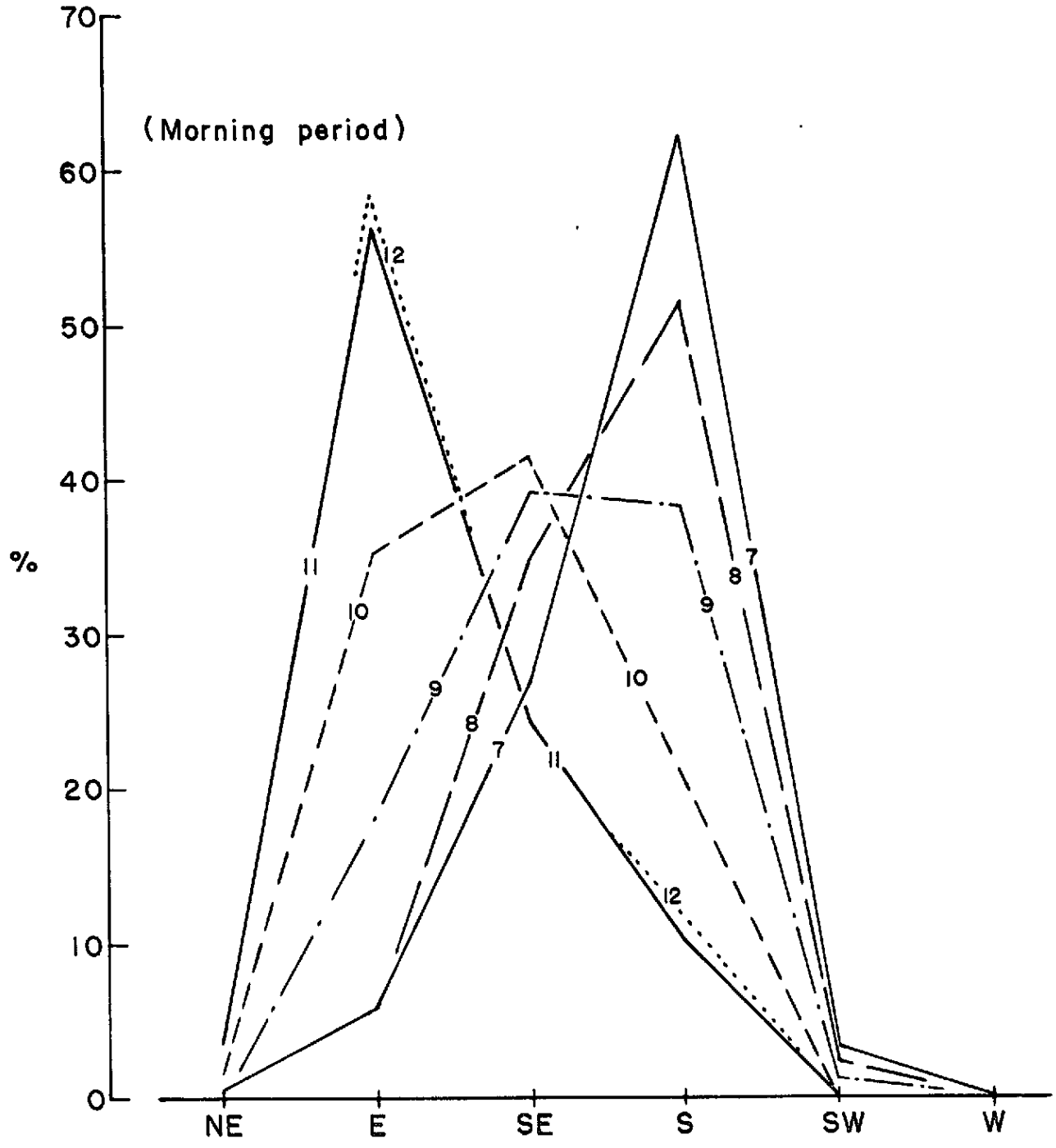

Fig.12 b — Same as fig.12 a for the months of Jul.(7) through Dec.(12). Note the counterclockwise rotation.

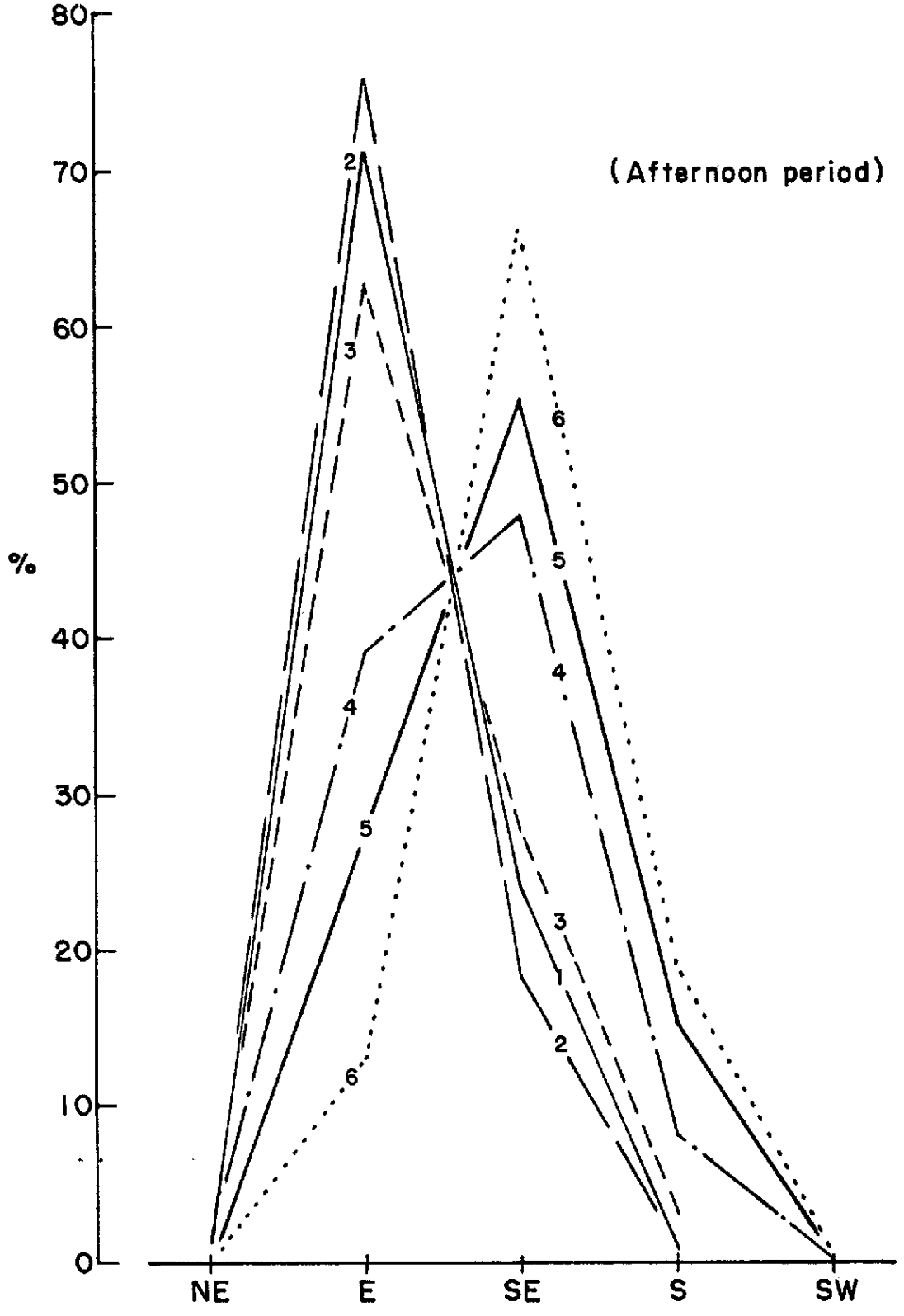

Fig.13a — Percentage of number of days with wind directions for the months Jan(1) to Jun.(6). Note the clockwise rotation from E to SE through the months. (see table VII).

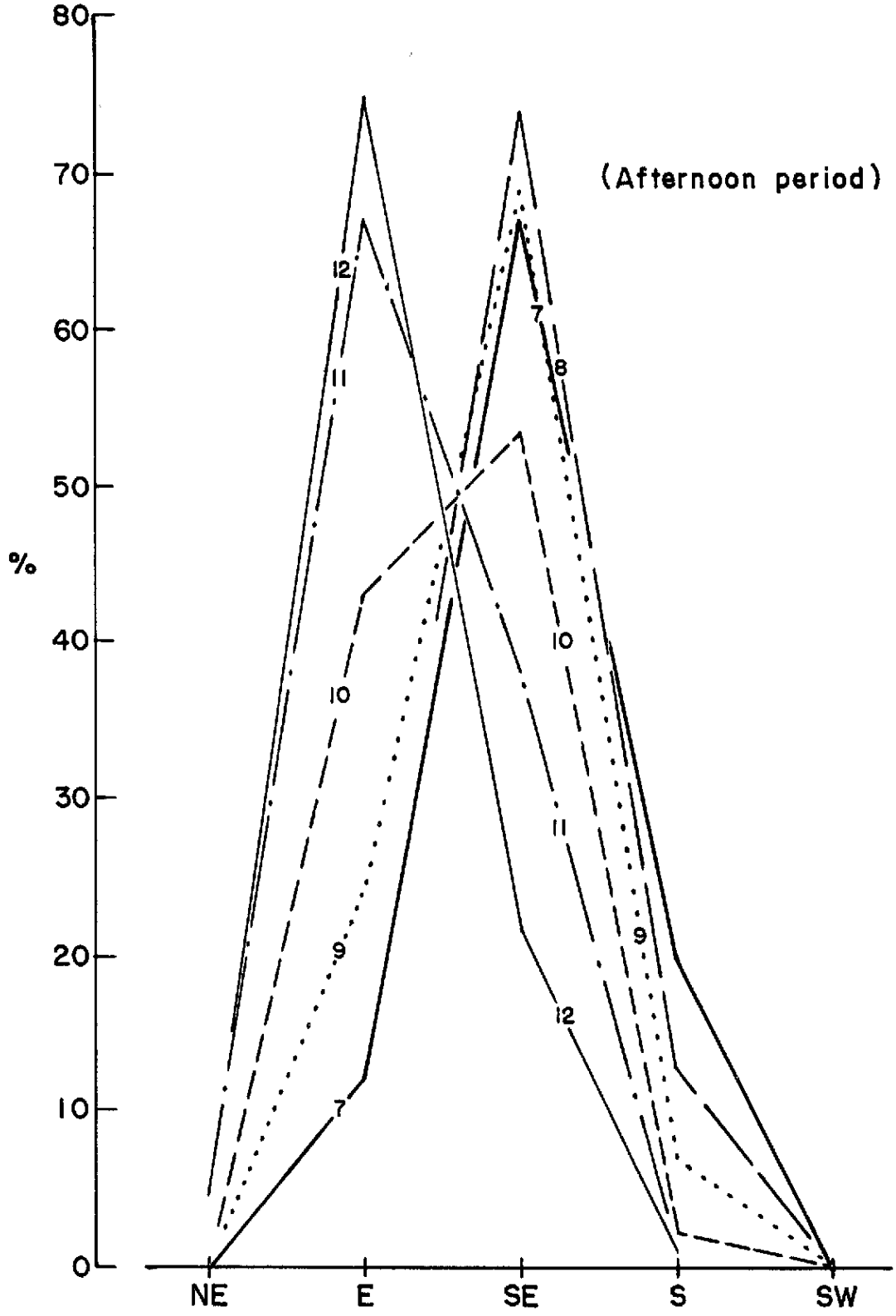

Fig.13b —Percentage of number of days with wind directions for the months Jul.(7) to Dec.(12). Note the counter-clockwise rotation through the months.(see table VII).

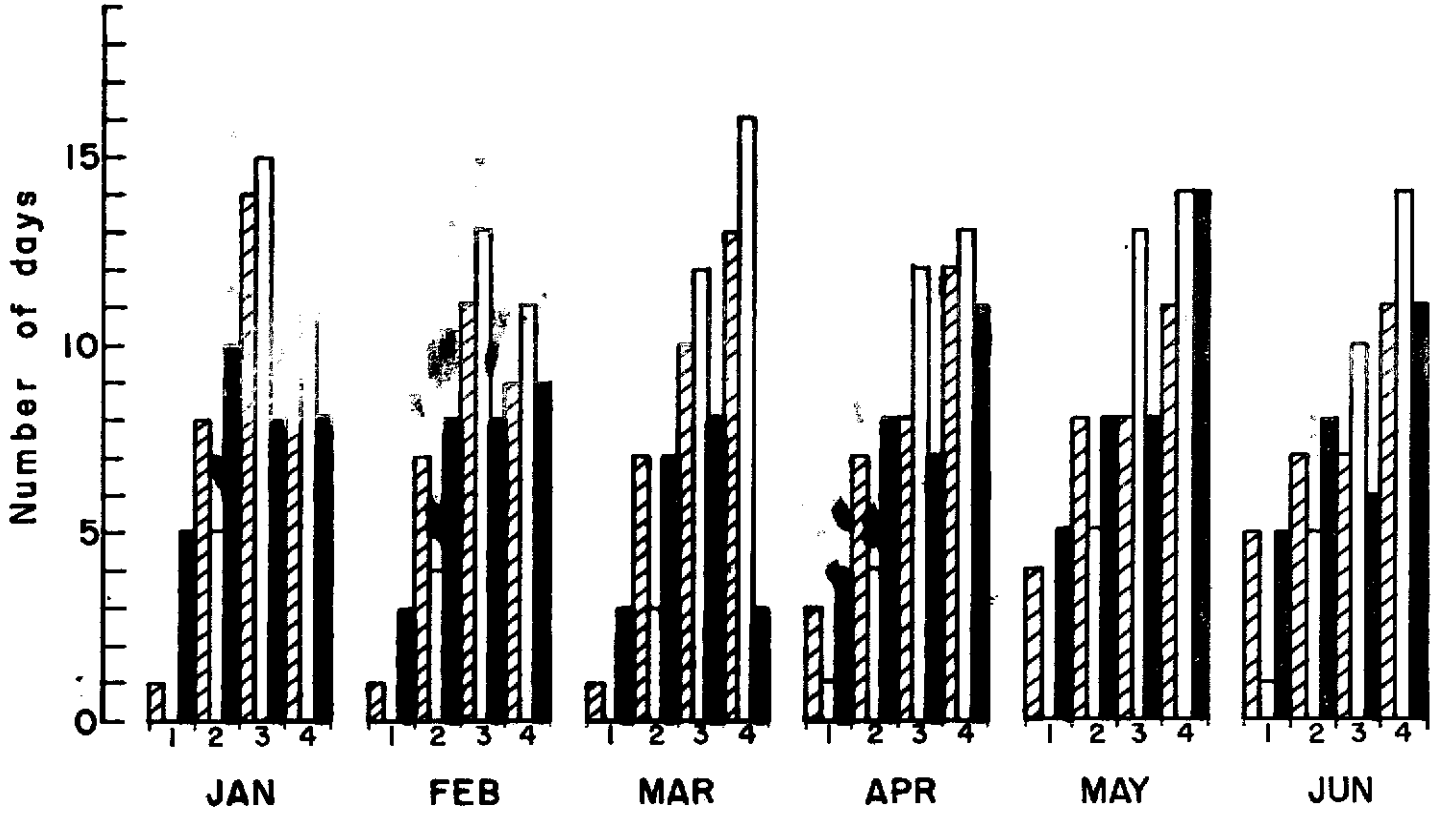

Fig. 14 – Number of days with cloud amount (all clouds)
(see table VIII, columns 42 to 45)

0800/1100 z
1200/1600 z
1700/2100 z

Symbols	Eighths of sky
1	0 – 2
2	3 – 4
3	5 – 6
4	7 – 8

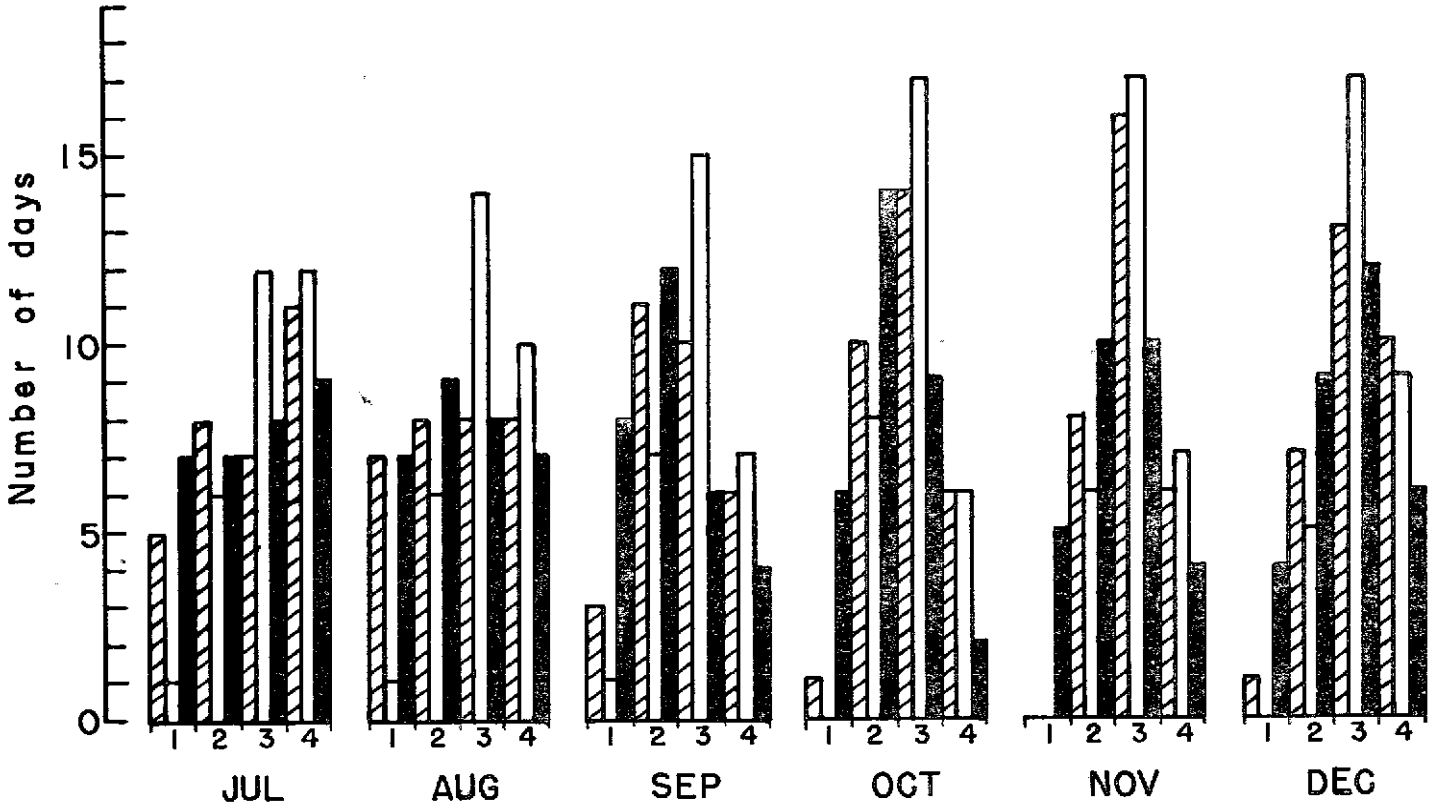

Fig. 15 — Same as Fig. 14

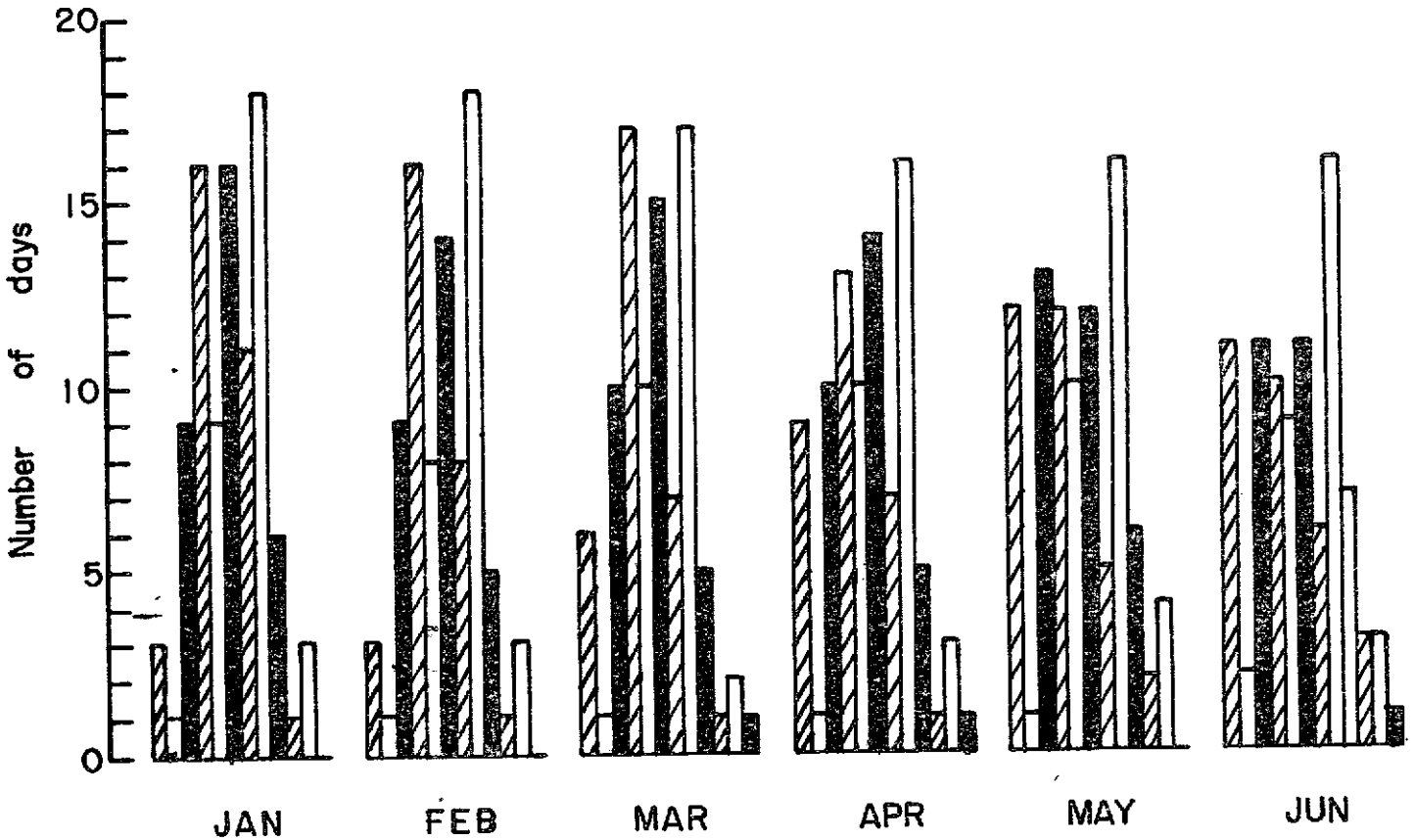

Fig: 16 - Number of days with low clouds. (See table VIII, col 46 to 49)

0800/1100 z
1200/1600 z
1700/2100 z

Symbols	Eighths of sky
1	0 — 2
2	3 — 4
3	5 — 6
4	7 — 8

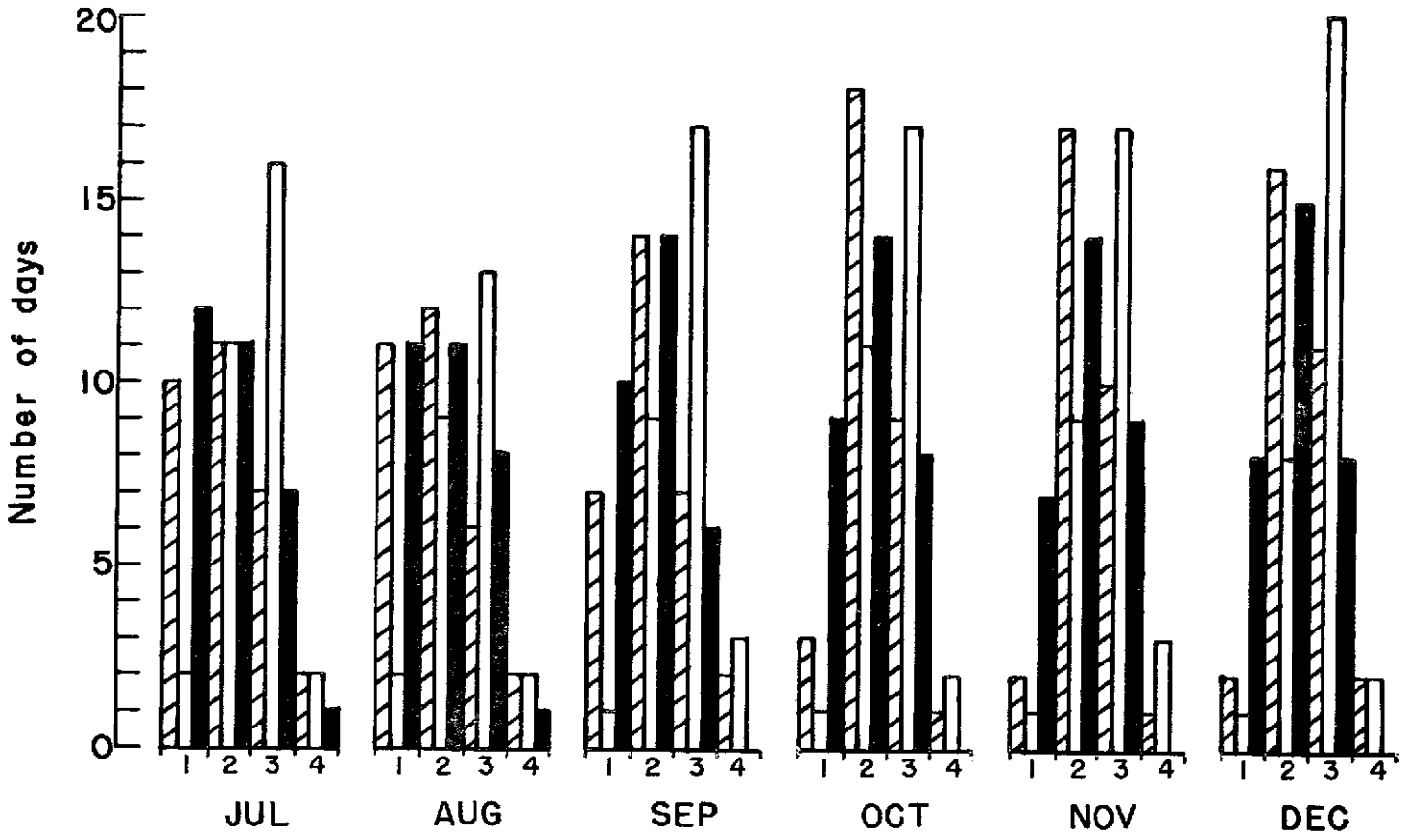

Fig. 16 (cont.)

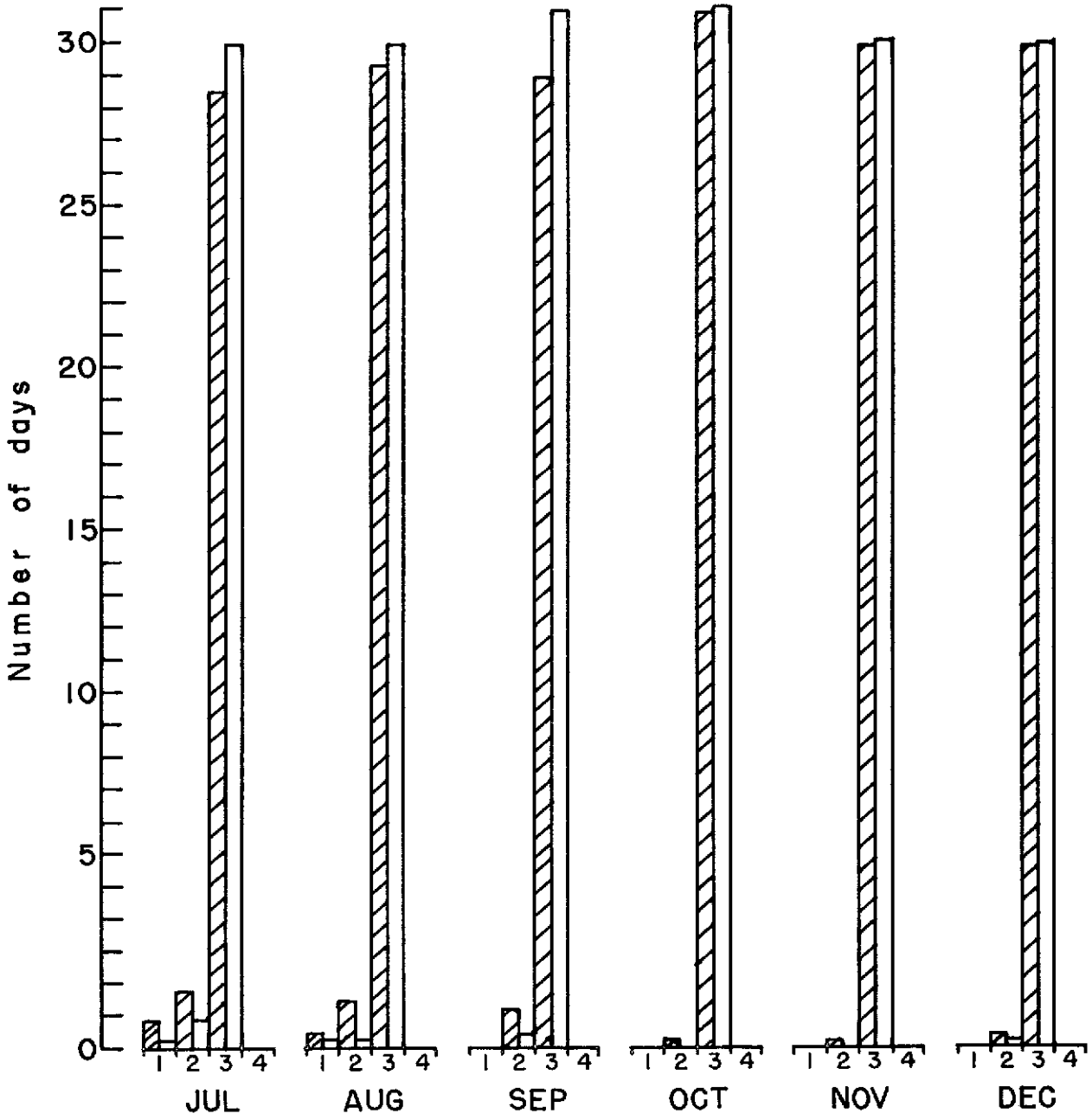

Fig. 18 (cont.)

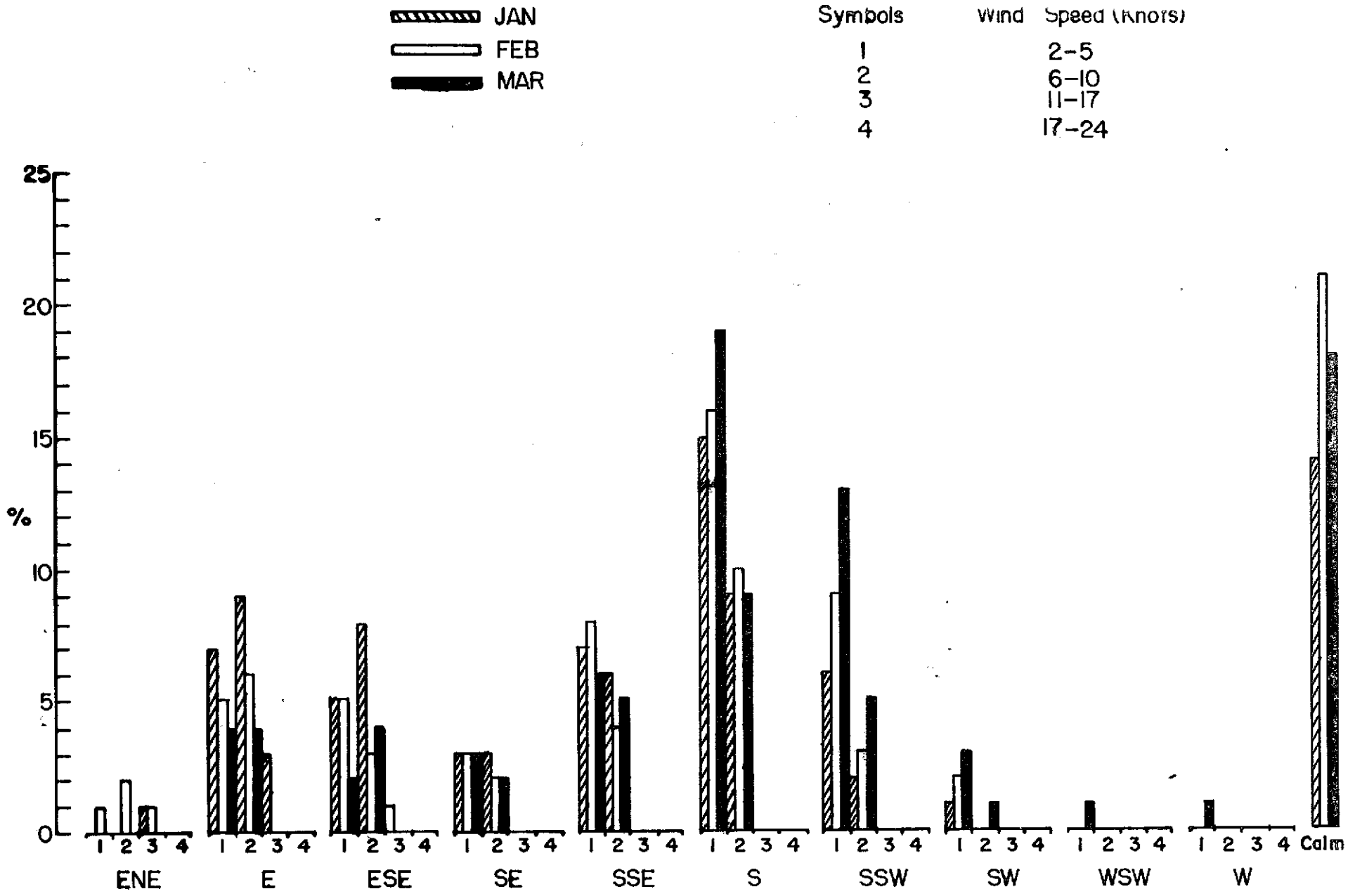

Fig: 19 - Percentage frequencies of occurrence of surface wind speeds for selected direction for the months of Jan, Feb, and Mar, in the period 0800/1100 GMT (See tables XII, XIII and XIV)

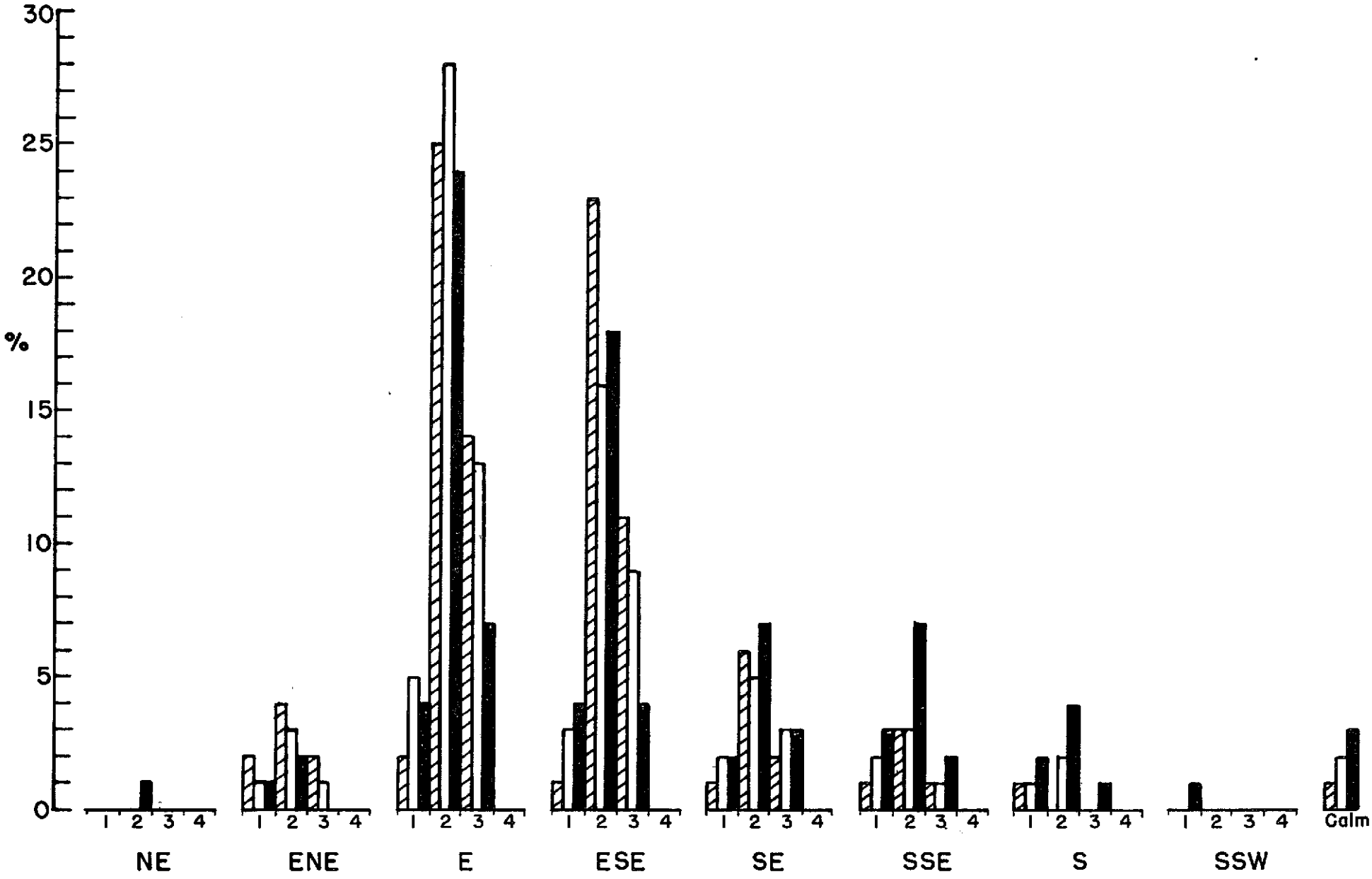

Fig. 20 — Same as Fig. 19, for the period 1200/1600z

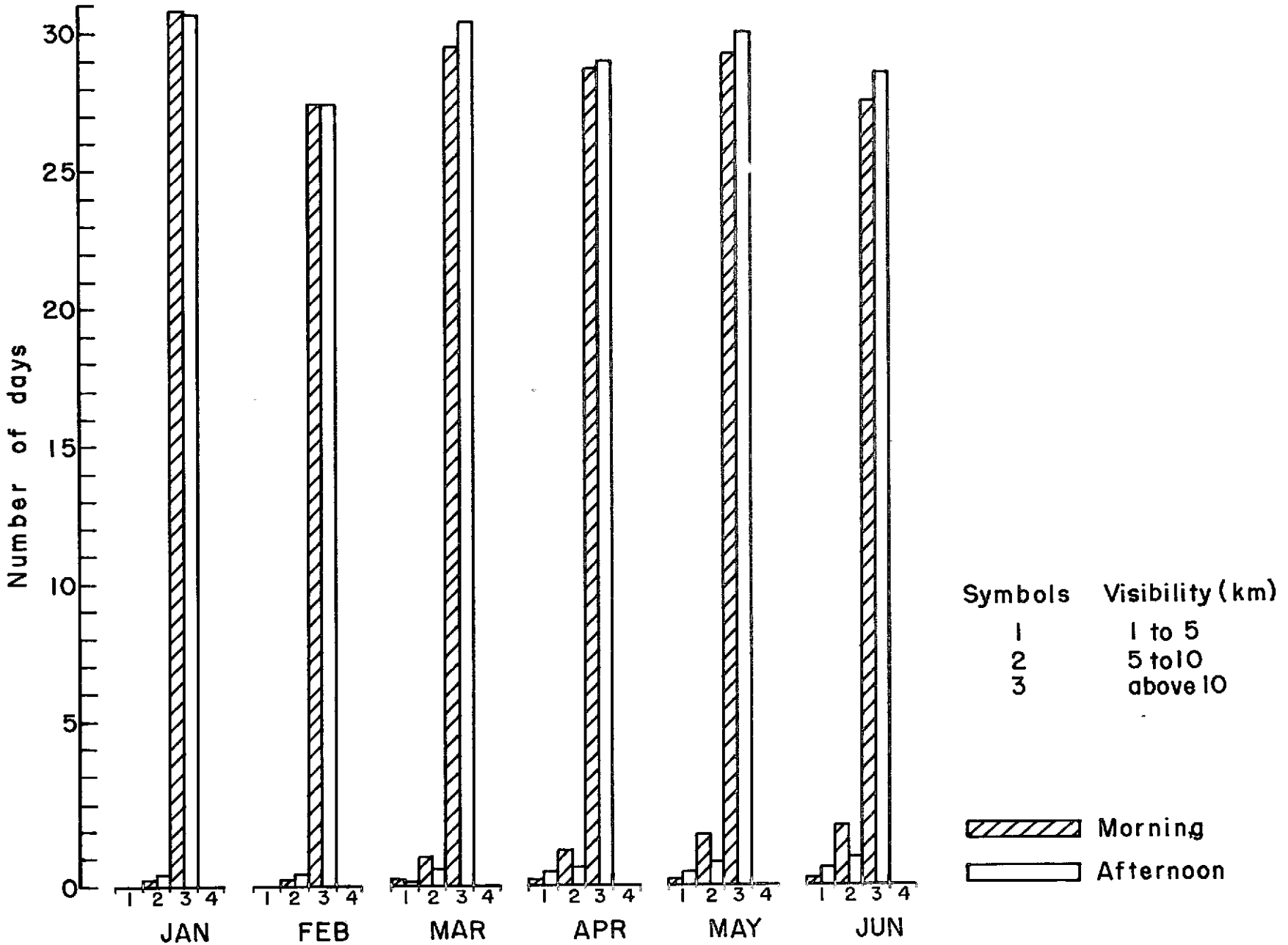

Fig. 18 — Visibility (see table IX, columns 50 to 53)

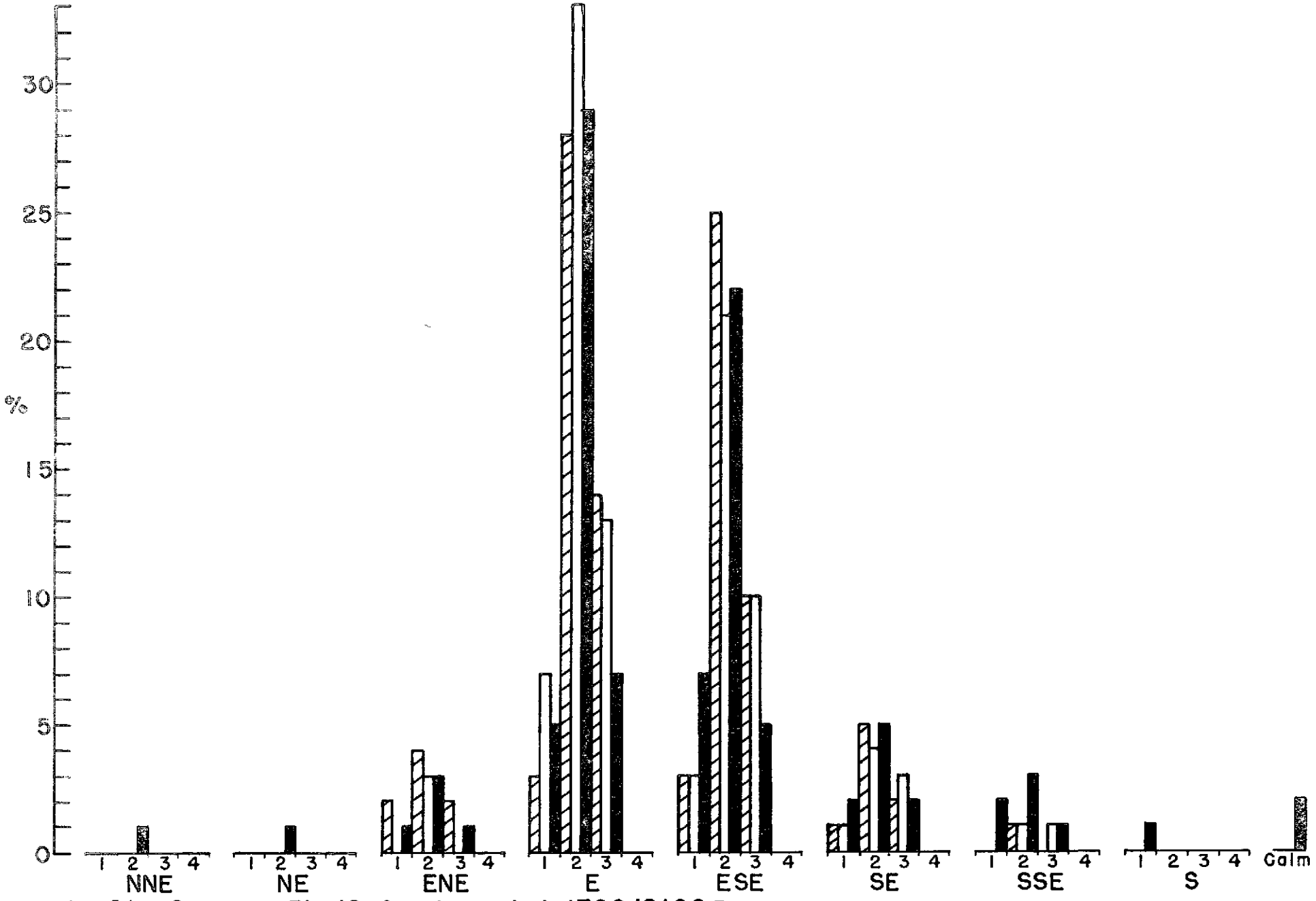

Fig. 21 — Same as Fig. 19, for the period 1700/2100 z

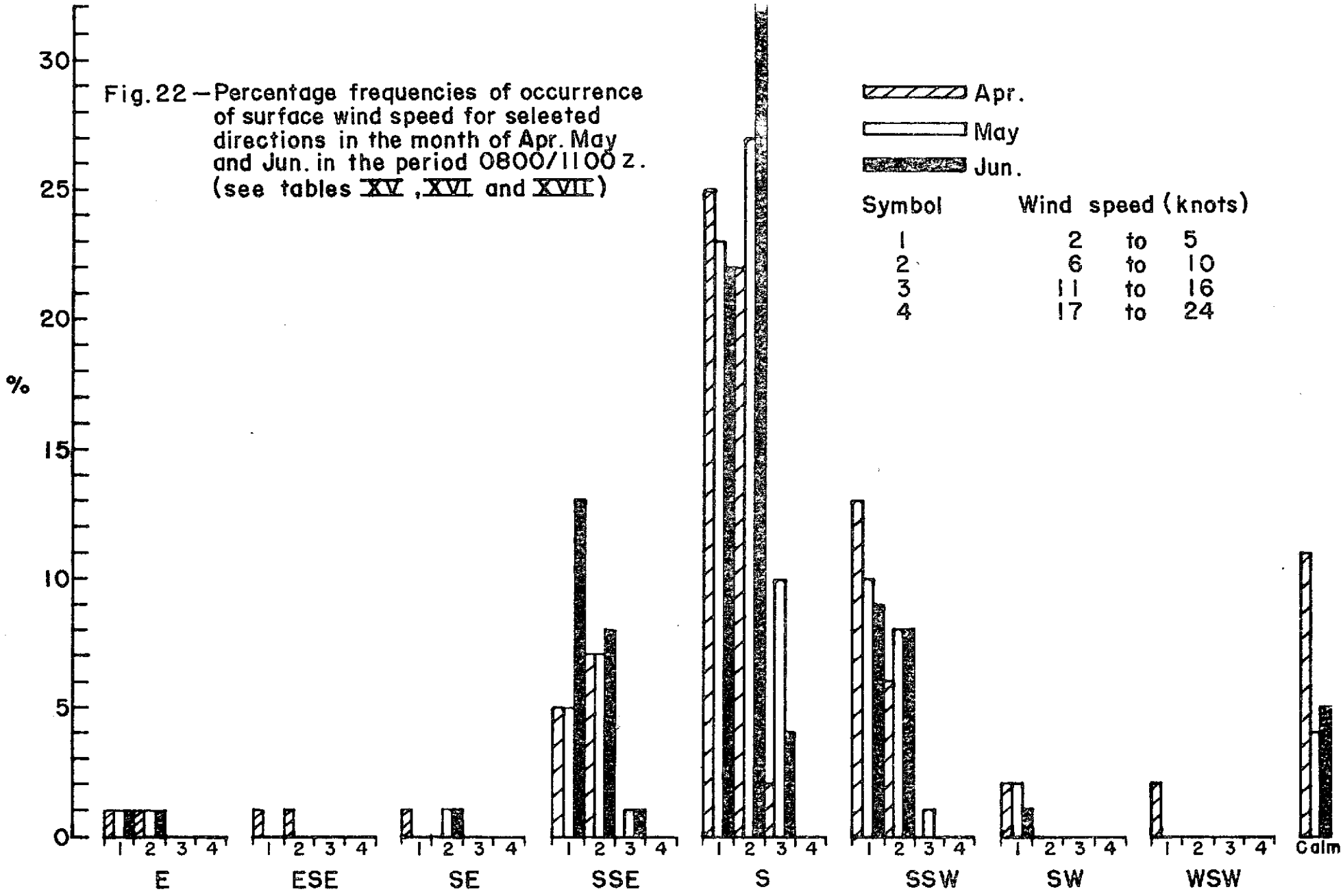
Fig. 22 — Percentage frequencies of occurrence of surface wind speed for seleeted directions in the month of Apr. May and Jun. in the period 0800/1100 z. (see tables XV, XVI and XVII)
Apr.
May
Jun.
Symbol
Wind speed (knots)
1 2 to 5
2 6 to 10
3 11 to 16
4 17 to 24
%
30
25
20
15
10
5
0
1 2 3 4
E
ESE
SE
SSE
S
SSW
SW
WSW
Calm

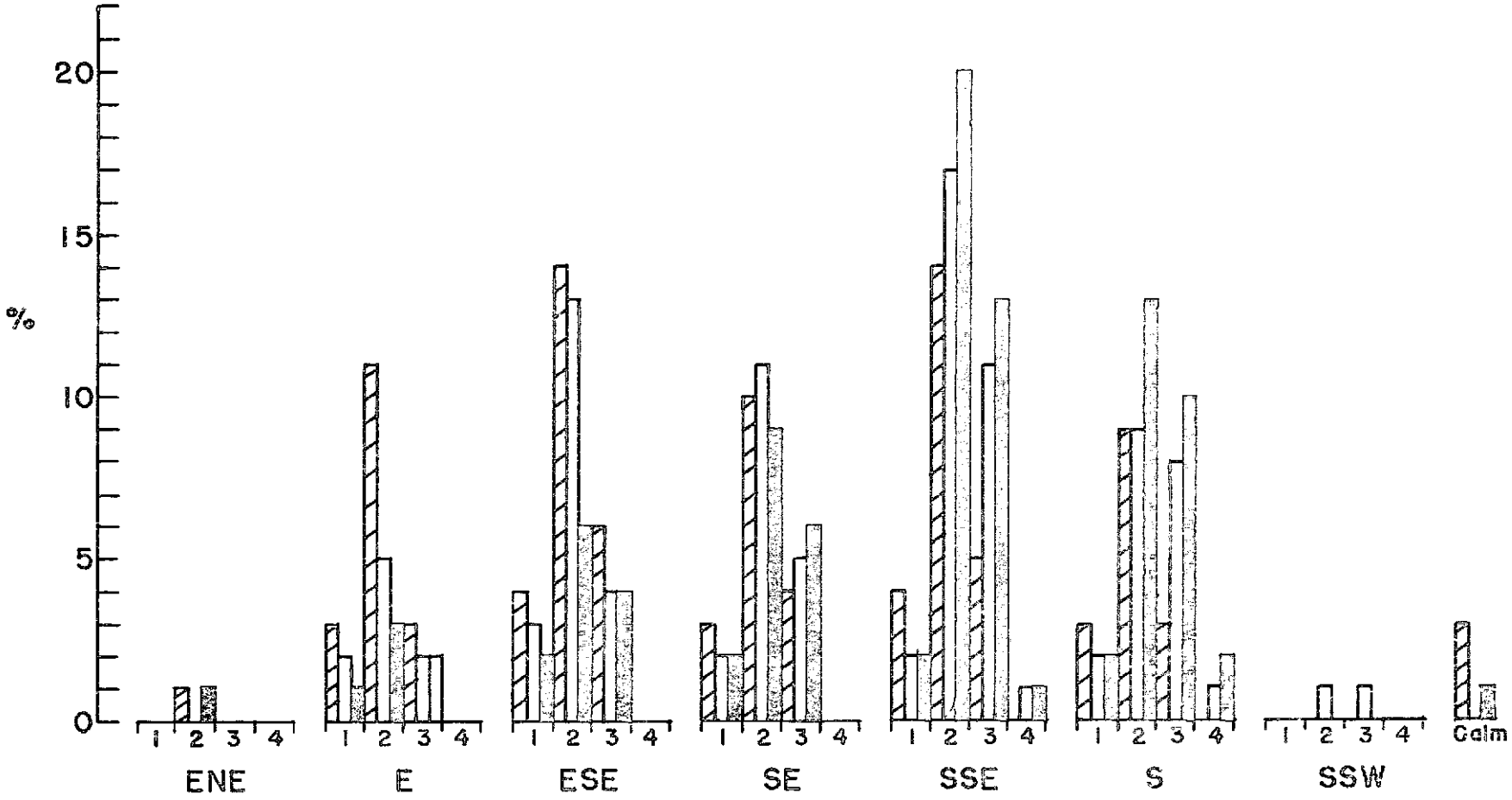

Fig. 23 – Same as Fig. 22, for the period 1200/1600z.

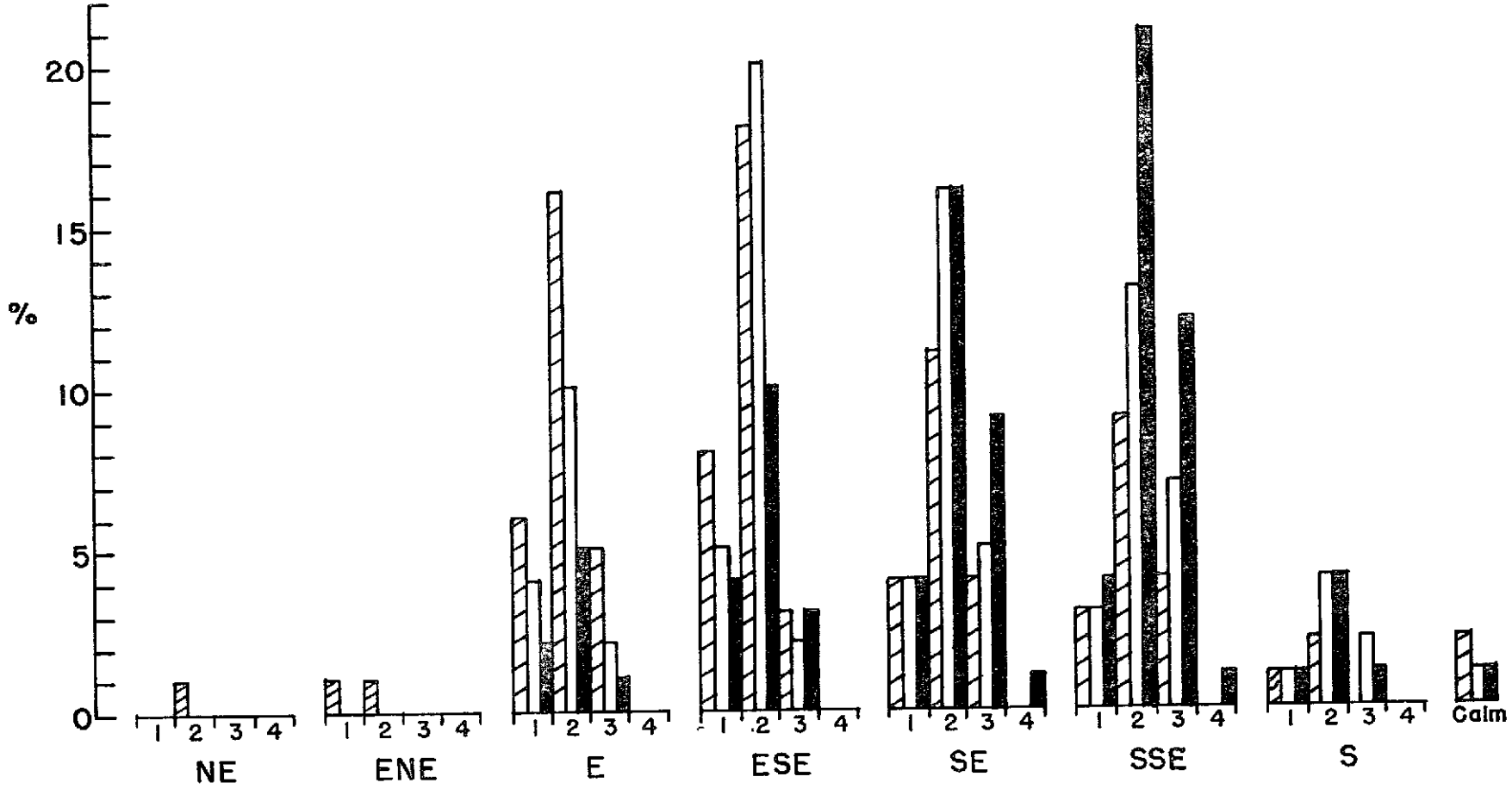

Fig. 24 — Same as Fig. 22, for the period 1700/2100 z.