

EUROPEAN SOUTHERN  
OBSERVATORY



BULLETIN NO. 9

The Governments of Belgium, the Federal Republic of Germany, France, the Netherlands, and Sweden have signed a Convention<sup>1)</sup> concerning the erection of a powerful astronomical observatory on October 5, 1962.

By this Convention a European organization for astronomical research in the Southern Hemisphere is created. Denmark became a member of the organization on June 1, 1967. The purpose of this organization is the construction, equipment, and operation of an astronomical observatory situated in the Southern Hemisphere. The initial programme comprises the following subjects:

1. a 1.00 m photoelectric telescope,
2. a 1.50 m spectrographic telescope,
3. a 1.00 m Schmidt telescope,
4. a 3.60 m telescope,
5. auxiliary equipment necessary to carry out research programmes,
6. the buildings for administration, laboratories, workshops, and accommodation of personnel.

The site of the observatory is in the middle between the Pacific coast and the high chain of the Andes, 600 km north of Santiago de Chile, on La Silla, at an altitude of 2400 m.

The geographical coordinates of the main summit of La Silla are

$$\lambda = + 70^{\circ} 43' 46'' 50$$

$$\varphi = - 29^{\circ} 15' 25'' 80.$$

They were determined by the Instituto Geográfico Militar of Santiago/Chile.

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<sup>1)</sup> The ESO Management will on request readily provide for copies of the Paris Convention of October 5, 1962.

Organisation Européenne pour des Recherches Astronomiques  
dans l'Hémisphère Austral

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## METEOROLOGICAL OBSERVATIONS ON LA SILLA IN 1970

B. E. Westerlund

### Introduction

The observations concern cloudiness, wind velocity, wind direction, temperature, and humidity as in previous years. They have been obtained at point S (between the 1.52 m telescope building and the 1 m telescope building) and at point T (second highest top, 2400 m). F. Middelburg and H.-E. Schuster have supervised the observations and compiled the tables.

### Clouds

The observations cover all 365 nights of the year. In Table 1 the percentages of photometric nights are given for each month. The mean values for 1966—1970 are given for comparison. All nights having six or more hours of uninterrupted clear sky are defined as photometric nights.

**Table 1:** Percentage of photometric nights

Month	1970	Mean of 1966—1970
January	74	79
February	64	81
March	58	79
April	77	65
May	39	45
June	50	44
July	45	42
August	45	52
September	37	50
October	48	53
November	77	66
December	90	86

Out of the total of 3681 hours during which observations might have been made, 2107 hours were totally clear. This compares unfavourably with 2481 hours in 1966, 2412 hours in 1967, and 2197 in 1968, but is slightly better than 1969 with 1996 hours.

The number of photometric clear nights in 1970 was 214. This is less than the mean value for 1966—1970 of 225 nights per year.

In Fig. 1 the percentage of clear nights, indicated on the vertical axis, is plotted against the month of the year for 1970 and for the mean of 1966—1970.

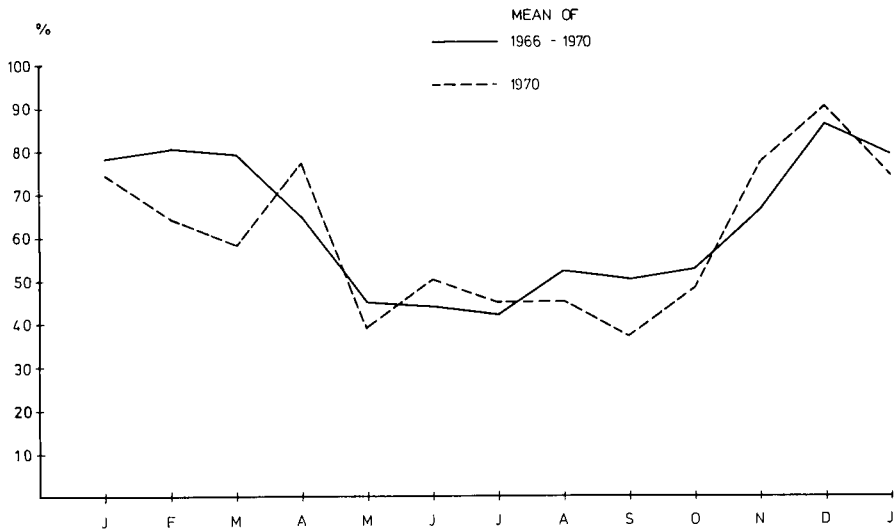


Fig. 1: Photometric nights.

### Maximum wind velocities during each month

In Table 2 the maximum wind velocities in m/s are given for each month as recorded at sites S and T. The maximum wind velocities are taken from all observations, regardless of cloudiness.

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**Table 2:** Maximum wind velocity in m/s at S and T

	1970	S	T
January	18	18	18
February	12	14	14
March	15	16	16
April	18	18	18
May	27	28	28
June	21	21	21
July	22	23	23
August	14	16	16
September	23	23	23
October	28	33	33
November	16	18	18
December	10	12	12

In Fig. 2 the maximum wind velocity at S is plotted against the month of the year for 1966 through 1970. On the vertical axis the wind velocity is given in m/s, on the horizontal axis the months of the year are given.

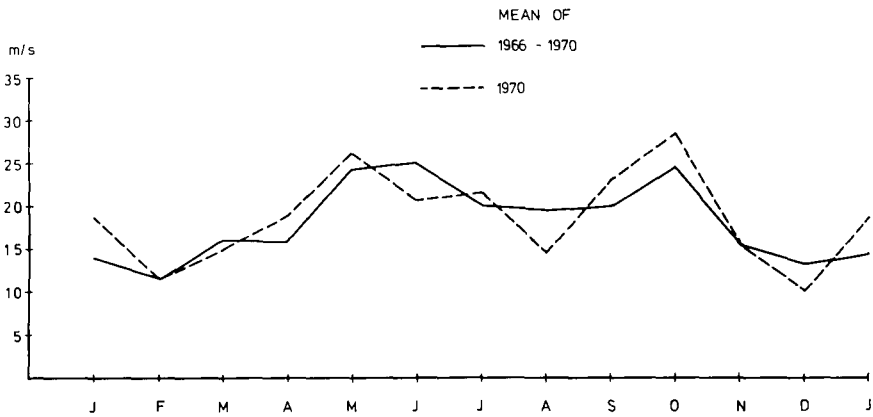


Fig. 2: Maximum wind velocity at site S.

**Average wind velocities during photometric nights**

Average wind velocities in m/s were read every two hours from recordings obtained at S and T throughout the year.

**Table 3:** Frequency of average wind velocity equal to  $v$  or less during photometric nights at sites S and T

$v$ m/s	Jan.		Feb.		March		April		May		June	
	S	T	S	T	S	T	S	T	S	T	S	T
1	5	22	26	37	8	16	4	28	1	8	1	3
2	22	27	46	45	23	24	15	33	7	14	2	3
3	31	31	66	52	35	30	47	45	15	17	7	6
4	42	42	75	63	46	39	71	63	23	24	8	7
5	50	48	82	74	57	46	84	78	31	30	12	8
6	53	51	—	81	68	56	102	86	36	36	16	11
7	62	57	—	82	73	64	110	99	42	39	17	15
8	66	64	—	—	76	71	122	110	47	41	28	18
9	71	66	—	—	77	74	124	118	53	45	34	22
10	76	74	—	—	77	75	131	125	54	52	42	29
11	79	77	—	—	78	76	133	128	60	54	53	39
12	80	79	—	—	79	76	136	131	62	61	59	49
13	81	80	—	—	80	79	136	133	64	61	66	60
14	83	80	—	—	83	81	138	136	64	63	75	68
15	85	84	—	—	84	83	—	136	65	64	80	75
16	87	85	—	—	—	84	—	138	66	65	84	77
17	88	87	—	—	—	—	—	—	67	66	86	82
18	—	88	—	—	—	—	—	—	69	67	86	85
19	—	—	—	—	—	—	—	—	70	67	86	85
20	—	—	—	—	—	—	—	—	72	72	87	86
21	—	—	—	—	—	—	—	—	—	—	88	88
$v$	5.9	6.0	2.4	2.7	4.4	5.5	5.2	5.5	7.6	8.7	10.5	11.6



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Table 3 continued

v m/s	July		Aug.		Sept.		Oct.		Nov.		Dec.	
	S	T	S	T	S	T	S	T	S	T	S	T
1	3	8	9	20	0	1	4	8	7	12	13	14
2	6	11	24	24	2	4	10	10	23	19	27	19
3	11	11	33	28	7	5	19	16	34	27	50	31
4	17	13	44	35	11	8	30	22	49	33	61	36
5	24	14	51	40	21	14	35	26	63	45	76	45
6	31	20	56	47	30	17	42	32	68	53	87	62
7	39	29	61	52	36	28	49	40	78	66	95	80
8	46	34	64	58	39	36	57	42	86	71	101	93
9	57	41	66	63	44	41	68	52	100	83	105	96
10	66	50	67	65	44	42	73	61	107	90	106	104
11	68	62	71	67	46	44	78	69	108	100	—	106
12	72	68	73	70	48	45	86	77	110	105	—	—
13	72	73	—	70	54	46	87	84	113	106	—	—
14	76	74	—	73	55	49	88	85	—	108	—	—
15	77	77	—	—	57	52	89	86	—	110	—	—
16	83	80	—	—	58	54	90	89	—	113	—	—
17	84	82	—	—	60	55	—	90	—	—	—	—
18	—	84	—	—	60	57	—	—	—	—	—	—
19	—	—	—	—	61	59	—	—	—	—	—	—
20	—	—	—	—	—	61	—	—	—	—	—	—
21												
v	8.1	9.2	4.5	5.4	7.8	9.4	6.9	8.1	5.6	6.9	4.2	5.5

Table 3 gives for sites S and T the number of observations with a wind velocity equal to or less than velocity  $v$  as given in the first column.

The last row, indicated by  $\bar{v}$ , gives for each month of the year the average wind velocity at S and T, during photometric nights.

In Fig. 3 the average wind velocities,  $\bar{v}$ , for 1970 and the means of the average wind velocities for 1966—1970 are plotted against the month of the year. The vertical axis gives the average wind velocity in m/s, the horizontal axis gives the month of the year.

The higher velocities occur during the months May to September.

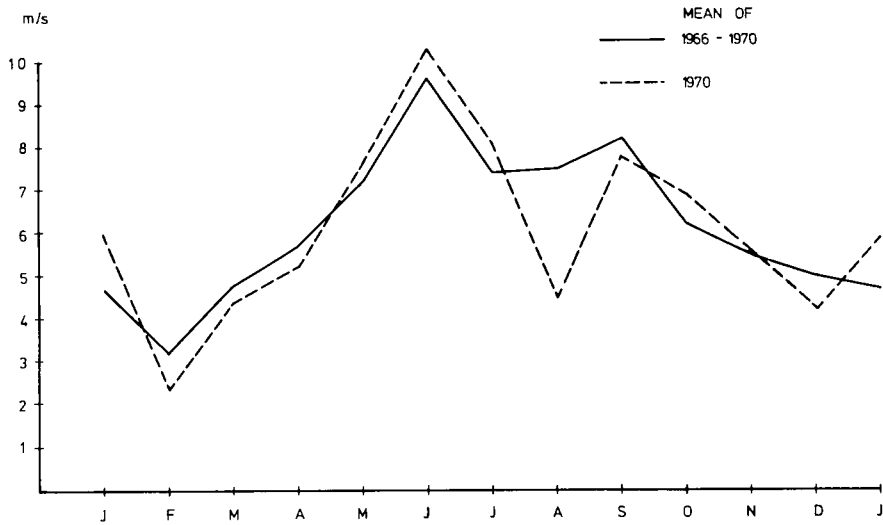


Fig. 3: Average wind velocity at site S.

**Wind directions during photometric nights**

At site T only, wind directions were recorded automatically on a wind direction recorder. The records have been read every hour. Table 4 gives for each month of the year the number of hourly observations with a wind direction as indicated in the first column.

This table is based on observations taken during photometric nights only. The last column gives the total results in percentages for 1970. They confirm that the prevailing wind is from NNE during photometric nights, as it was also found in 1967—1969.

**Table 4:** Wind directions at site T during photometric nights

Wind direction	J	F	M	A	M	J	J	A	S	O	N	D	All 1970 in %
S	10	30	18	30	8	5	8	14	4	10	16	14	7.5
SSW	12	27	54	66	28	0	12	13	7	13	8	49	13.0
SW	5	8	1	2	0	1	1	3	1	0	5	4	1.4
WSW	4	1	1	0	0	0	0	3	1	1	0	3	0.6
W	3	3	2	2	0	0	2	4	0	0	1	2	0.9
WNW	1	1	2	1	0	0	0	2	0	0	0	0	0.3
NW	4	3	1	6	2	2	2	2	0	4	2	1	1.3
NNW	2	5	7	4	3	0	0	3	0	0	3	0	1.2
N	41	17	19	40	16	47	19	17	17	32	27	36	14.8
NNE	78	22	27	49	47	114	120	51	68	85	117	81	37.4
NE	32	16	23	41	25	10	15	26	12	6	30	19	11.5
ENE	13	8	11	10	2	2	1	5	1	1	8	4	3.0
E	0	9	4	2	0	4	0	2	2	2	5	6	1.6
ESE	0	5	3	4	0	3	0	4	3	3	1	3	1.3
SE	0	12	2	7	1	4	0	5	2	1	5	5	2.0
SSE	2	13	5	9	0	3	2	5	3	0	2	5	2.2

**Maximum and minimum temperatures during each month**

Table 5 gives for each month the maximum and minimum temperatures as measured at S and T. The temperatures were read daily, regardless of the cloudiness, from a maximum-minimum thermometer.

**Table 5**

1970	Temperatures in °C			
	Max.	Min.	Max.	Min.
January	+ 25	+ 4	+ 25	+ 6
February	+ 25	+ 6	+ 27	+ 6
March	+ 26	+ 3	+ 25	+ 4
April	+ 26	+ 9	+ 26	+ 10
May	+ 23	— 3	+ 22	— 2
June	+ 19	— 4	+ 18	— 3
July	+ 21	— 3	+ 20	— 2
August	+ 24	— 4	+ 22	— 5
September	+ 23	— 2	+ 20	— 2
October	+ 23	— 1	+ 21	— 1
November	+ 24	+ 4	+ 24	+ 4
December	+ 23	+ 8	+ 22	+ 7

In Fig. 4 maximum and minimum temperatures as measured at S in 1970 and the mean values of 1966—1970 are plotted against the month of the year. On the vertical axis the temperature is given in degrees Celsius, on the horizontal axis the months of the year are indicated.

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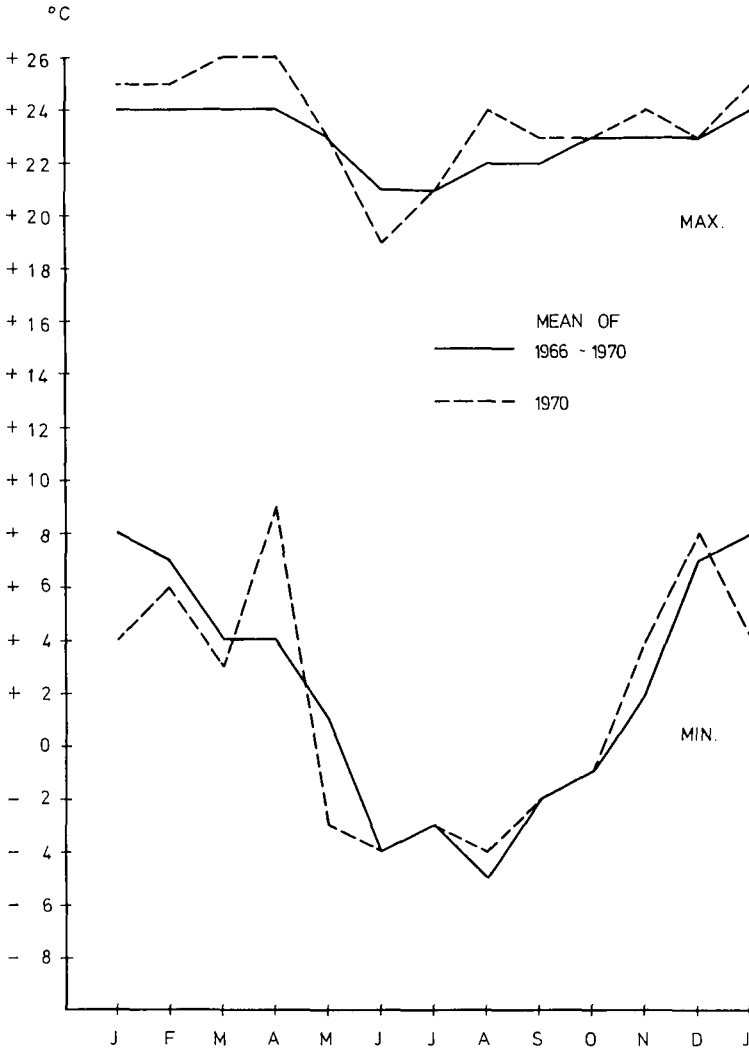


Fig. 4: Maximum and minimum temperatures at site S.

The differences between the maximum day temperature and the following minimum night temperature have been calculated and are given in Table 6 for all days and nights during the month regardless of the cloudiness. The table gives for each month the number of days for which the temperature difference was equal to or less than the value indicated in the first column.

Due to technical difficulties, the number of days shown in Table 6 is sometimes less than the actual number of days of the corresponding month.

The last column in Table 6 gives for site S the total results in percentages over the year.

**Table 6:** Cumulative table of differences between maximum day temperature and minimum temperature of the following night for the sites S and T

Diff. °C	Jan.		Feb.		March		April		May		June	
	S	T	S	T	S	T	S	T	S	T	S	T
1	0	1	0	0	0	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0	0	0	0	0	0
3	0	1	0	0	0	0	0	0	0	1	0	0
4	0	1	0	0	0	0	0	1	1	2	0	1
5	0	2	0	0	0	0	0	1	1	5	0	1
6	0	3	0	2	0	1	1	4	2	9	3	6
7	0	3	1	5	2	4	4	7	7	13	4	9
8	1	10	5	10	8	11	7	11	12	16	7	14
9	4	14	10	17	10	13	11	17	16	21	13	20
10	12	19	17	21	15	23	17	26	20	24	20	25
11	13	20	21	25	19	25	23	29	25	26	22	27
12	23	26	25	25	28	28	28	30	27	28	25	27
13	24		28	27	30	30	30		29	29	26	27
14	26		27		30	31			30		26	28
15			28		31				30		26	
16									30		27	
17									30			
18									31			
19												
20												
21												
22												
23												

Meteorology 1970 on La Silla

Table 6 continued

Diff. °C	July		Aug.		Sept.		Oct.		Nov.		Dec.		All 1970 in % S
	S	T	S	T	S	T	S	T	S	T	S	T	
1	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	1	0	0	0	0	0
3	0	0	0	0	0	0	1	1	0	0	0	1	1
4	0	1	0	1	0	0	1	2	0	0	2	2	1
5	0	1	1	1	0	0	2	5	0	0	2	3	2
6	1	3	1	1	0	1	2	5	1	1	3	4	4
7	2	8	1	1	3	5	3	7	2	2	4	6	9
8	11	17	3	5	4	9	6	13	4	8	6	10	21
9	15	23	7	12	5	15	8	17	6	11	12	16	33
10	17	26	11	16	13	19	16	22	10	19	19	26	52
11	23	27	19	24	16	23	20	26	16	25	26	29	67
12	26	28	24	27	22	27	24	27	26	28	31	31	87
13	27	29	25	28	22	28	26	29	28	30			92
14	28		29	30	26	29	29	29	30				97
15	29		30	30	27	29	29	29					98
16			30	30	27	29	30	31					99
17			30	30	28	29	31						99
18			30	30	29	30							99
19			30	30	29								99
20			30	30	30								99
21			30	30									99
22			31	30									100
23				31									

**Maximum temperature fluctuations during photometric nights**

Table 7 gives for each month, for sites S and T, the number of photometric nights during which the maximum temperature fluctuation occurring throughout the astronomical night was equal to or less than the values indicated in the first column.

The astronomical night is defined as the interval of time during which the sun is 18° or more below the observer's horizon.

The last column in Table 7 gives for site S the total results in percentage for 1970.

As in previous years, the observations show the constancy of the temperature during photometric nights.

**Table 7: Cumulative table maximum temperature fluctuations during photometric nights**

$\Delta T$ °C	Jan.		Feb.		March		April		May		June	
	S	T	S	T	S	T	S	T	S	T	S	T
1	6	8	6	6	5	6	1	7	3	4	5	6
2	16	18	14	14	14	16	15	21	8	8	9	13
3	22	21	18	18	17	18	16	22	11	10	11	14
4	23	23			18		21	22	11	11	14	15
5							22	22	12	11	15	
6							23	22		11		
7								22		11		
8								23		12		



Meteorology 1970 on La Silla

Table 7 continued

$\Delta T$ °C	July		Aug.		Sept.		Oct.		Nov.		Dec.		All 1970 in % S
	S	T	S	T	S	T	S	T	S	T	S	T	
1	1	4	2	6	2	6	6	8	5	5	13	17	26
2	10	10	8	11	9	9	13	14	19	12	18	23	72
3	12	12	12	13	9	11	15	15	21	17	22	26	87
4	14	13	13		11				22	19	25	27	96
5		14							23	21	27	27	99
6										23	27	27	99
7											28	28	100
8													

**Relative humidity during photometric nights**

Table 8 gives for sites S and T and each month the percentage of hourly observations for which the relative humidity was equal to or less than the value indicated in the first column. The last column gives the total results in percentage for 1970. The last row, indicated R. H., gives for each month of the year the average relative humidity at S and T during photometric nights.

**Table 8:** Cumulative table of relative humidity at sites S and T

Rel. Hum. %	Jan.		Feb.		March		April		May		June	
	S	T	S	T	S	T	S	T	S	T	S	T
10	2	3	0	0	0	5	0	2	25	31	46	17
20	11	9	0	3	10	16	19	20	37	44	70	63
30	32	19	4	6	39	46	58	56	64	69	85	76
40	58	32	31	18	56	60	95	87	76	78	46	82
50	87	48	57	40	74	68	100	99	82	83	98	99
60	100	66	81	60	86	76		100	85	85	99	99
70		88	97	83	94	86			95	94	100	100
80		97	100	92	100	93			99	97		
90		100		99		99			100	99		
100				100		100				100		
R. H.	40	54	55	59	44	45	33	33	34	32	21	26

Meteorology 1970 on La Silla

Table 8 continued

Rel. Hum. %	July		Aug.		Sept.		Oct.		Nov.		Dec.		All 1970 in % S
	S	T	S	T	S	T	S	T	S	T	S	T	
10	43	30	22	44	0	0	3	5	0	0	0	2	11
20	79	73	57	76	37	39	34	33	2	2	0	9	28
30	82	83	91	91	65	75	69	65	9	10	8	33	49
40	91	85	94	94	79	83	89	84	36	39	35	56	70
50	97	92	97	98	87	89	97	93	70	70	60	80	83
60	98	97	100	99	92	95	99	96	90	93	82	93	93
70	98	97		99	98	98	100	99	97	98	95	99	98
80	99	98		100	100	99		100	99	99	100	100	99
90	100	98				100			99	100			100
100		100							100				
R. H.	21	24	24	20	34	32	31	32	50	49	52	53	

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In Fig. 5 the R. H. at site S is given graphically for 1970 and for the mean of 1966—1970. The vertical axis gives the R. H., and the horizontal axis gives the month of the year.

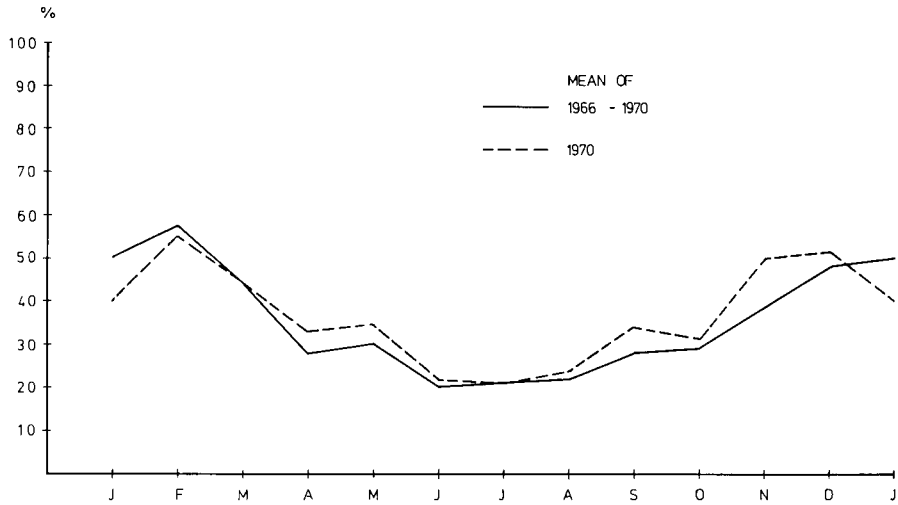


Fig. 5: Relative humidity at site S.

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