

SOLAR, GEOMAGNETIC, IONOSPHERIC AND OZONE DATA

KODAIKANAL SOLAR, GEOMAGNETIC AND IONOSPHERIC DATA

(JANUARY—MARCH 1961)

Tables 1 to 5 summarise the data on solar and geomagnetic phenomena. The hourly median values of critical frequency and virtual height for the ionospheric layers are given in Table 6.

TABLE 1
Prominent sunspot groups

Kodaikanal serial No. of spotgroup	Mean latitude	Date of central meridian passage	Total area (millionths of the Sun's visible hemisphere at central meridian passage)
12063	15°N	Jan 1	1145

TABLE 2
Solar Flares

Date	Time in GMT						Co-ordinates		Importance	H-alpha line width Å	Remarks
	Beg.		Max.		End.		Mean latitude	Mean longitude			
	h	m	h	m	h	m					
Jan 17	04	45	04	55	05	02	8°S	45°W	2	2.4	Observed in spectrohelioscope and filtergram
Jan 18	06	31	06	32	06	36	10°N	11°E	1	2.1	Do.
Feb 1	07	08	10°N	15°W	1	..	Observed in filtergram

TABLE 3

Sudden disappearance of prominences and H-alpha dark markings

Phenomenon	Date and time (GMT) of phenomenon when last seen		Co-ordinates of phenomenon		Remarks
			Mean latitude	Mean longitude	
Dark marking	22 Jan	0951	30°N	33°E	Dark marking observed on 22nd and was not seen on 23rd
Prominence	25 Jan	0437	20°S	90°E	Prominence began to change shape at 0437 U.T. Most of the prominence disappeared by 0816 U.T.
Dark marking	30 Jan	0820	14°S	33°W	Dark marking observed on 30th was not seen on 31st
Prominence	2 Feb	0610	25°S	90°W	Prominence began to change shape at 0610 U.T. and disappeared at 0648 U.T.
Prominence	28 Feb	0400	22°N	90°E	Prominence began to change shape at 0400 U.T. and disappeared at 0536 U.T.
Prominence	28 Feb	0535	05°N	90°E	Prominence began to change shape at 0535 U.T. Most of the prominence disappeared at 0619 U.T.
Dark marking	5 Mar	1030	12°N	18°E	Dark marking observed on 5th was seen mostly disappeared on 6th
Prominence	14 Mar	0450	08°N	90°E	Prominence began to change shape at 0450 U.T. Disappeared at 0648 U.T.
Prominence	18 Mar	0729	25°N	90°W	Prominence began to change shape at 0729 U.T. Most of the prominence disappeared by 0905 U.T.
Prominence	24 Mar	0332	12°S	90°E	Prominence began to change shape at 0332 U.T. and disappeared at 0348 U.T.
Prominence	26 Mar	0419	11°N	90°W	Prominence began to change shape at 0419 U.T. and disappeared at 0615 U.T.

TABLE 4
Daily Solar Data

Date	JANUARY 1961			FEBRUARY 1961			MARCH 1961		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
1	186	3531	3	80	1813	5	11	2219	6
2	119	4063	3	63	2906	2	11	3531	4
3	124	4344	1	53	2750	1	58	2219	4
4	124	4656	5	62	2875	5	62	2688	5
5	—	—	—	66	2875	3	26	1938	4
6	—	—	—	65	2406	3	42	1844	3
7	64	3406	5	68	2094	2	32	2188	2
8	52	4406	8	45	1344	—	41	1531	1
9	45	5000	5	52	1719	1	42	1938	2
10	—	—	—	45	—	—	30	9609	3
11	—	—	—	58	1375	7	39	4308	5
12	—	—	—	31	1906	—	15	1313	1
13	20	2844	—	32	—	—	14	2250	7
14	38	—	12	20	—	—	57	1594	—
15	—	—	—	—	—	—	54	1406	4
16	—	—	—	—	—	—	67	1594	6
17	32	2500	1	12	—	1	60	1437	5
18	57	—	7	22	2563	3	60	1031	7
19	—	—	—	23	1844	2	41	1781	5
20	31	—	—	26	1750	3	46	1875	2
21	42	3219	11	45	—	—	46	2156	2
22	52	4781	6	62	2063	3	51	2000	4
23	43	4563	2	58	2094	2	63	2469	2
24	23	4969	2	62	2654	4	68	1250	1
25	34	5719	4	59	1594	3	59	1000	2
26	25	5125	8	55	2438	7	69	1625	6
27	52	4063	3	24	2781	4	78	3000	4
28	94	3656	3	11	2688	4	80	2656	1
29	69	3563	1	—	—	—	78	2219	3
30	56	3531	3	—	—	—	83	1156	6
31	67	1781	—	—	—	—	86	—	—

— No observation

(a) Relative sunspot number

(b) H-alpha dark markings (Areas in millionths of the sun's visible hemisphere)

(c) Calcium prominences (Areas in square minutes of arc)

TABLE 5
Principal magnetic storms

Greenwich day 1961	Storm-time				Sudden commencement			C-figure degree of activity ⁴	Maximal activity Green- wich day	Ranges			
	GMT of beginning		GMT of ending ¹		Type ²	Amplitude ³				D	H	Z	
	h	m	d	h		D	H						Z
					'					γ	γ	'	
Feb 4	18	25	5	18	s.c.	<1	32	18	m	5	3	144	60
Feb 16	00	39	18	20	s.c.	1	14	7	ms	17	6	276	72
Mar 9	13	27	10	23	s.c.	1	23	13	ms	10	8	316	60
Mar 27	14	59	28	15	s.c.	<1	22	12	m	28	4	199	48

The following symbols and conventions have been used according to recognised practice—

- Approximate time of ending of storm construed as the time of cessation of reasonably marked disturbance movements in the traces
- s.c.=sudden commencement ...=gradual commencement
- Signs of amplitudes of *D* and *Z* taken algebraically:
(*D*—reckoned negative being westerly)
(*Z*—reckoned positive being vertically downwards)
- Storm described by three degrees of activity:
m—for moderate (when range is less than 250 γ)
ms—for moderately severe (when range is between 251 γ and 400 γ)
s—for severe (when range is above 400 γ)

TABLE 6

Beginning from January 1952, systematic ionospheric observations are being made at Kodaikanal with the Automatic Multi-frequency Ionosphere Recorder (Type C-3) made by the National Bureau of Standards, U.S.A. The general electrical characteristics of the instruments are given below—

- (a) Supply voltage—90 to 260 volts AC single phase
 (b) Supply frequency—50 to 60 cps
 (c) Power load—approximately 30 amperes at 115 volts
 (d) Pulse recurrence frequency—from 10 to 90 pps
 (e) Frequency sweep time—7½, 15 or 30 seconds and 30, 60 or 120 seconds
 (f) Frequency sweep range—1 to 25 megacycles
 (g) Frequency sweep interval—5, 15, 30 or 60 minutes
 (h) Height ranges—0-500, 0-1000, 0-4000 kilometres
 (i) Peak-pulse power—approximately 10 kilowatts

Ionospheric data (Median value:)

Kodaikanal (10°2'N, 77°5'E)		January 1961					
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	6.8	240					3.15
01	6.4	240					3.20
02	5.7	240					3.25
03	4.5	240					3.30
04	3.8	240					3.35
05	2.2	260					3.50
06	3.4	270					3.00
07	7.1	240	120			G	3.25
08	9.0	320	110	3.0		G	2.90
09	9.1	205	110			G	2.65
10	8.7	200					8.4 2.55
11	300 8.8	190	4.9				8.2 2.60
12	9.0	195					8.2 2.50
13	9.3	195	105				7.8 2.50
14	10.1	200	105	3.5	7.2		2.55
15	10.6	210	110		3.6		2.60
16	10.7	220	110	3.0	4.6		2.55
17	10.4	240	120		2.6		2.65
18	9.6	270					2.50
19	8.9	300					2.45
20	8.9	270					2.70
21	8.8	240					2.95
22	7.5	230					3.10
23	7.2	230					3.20

Kodaikanal (10°2'N, 77°5'E)		February 1961					
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	7.8	230					3.30
01	7.5	225					3.30
02	6.4	230					3.40
03	5.3	235					3.40
04	4.4	240					3.40
05	3.6	240					3.30
06	3.6	260					3.05
07	7.3	240					3.30
08	9.2	220	110		2.8	G	3.10
09	10.2	210	110				6.7 2.75
10	9.7	200	110				8.6 2.50
11	8.9	200	110				8.3 2.50
12	8.8	200	105				8.4 2.50
13	9.1	200	105				8.4 2.50
14	9.6	200	110				7.9 2.55
15	9.9	210	110				6.7 2.60
16	10.0	220	110				6.5 2.60
17	10.4	240					4.7 2.60
18	10.3	270					2.55
19	9.4	310					2.50
20	9.0	300					2.70
21	9.3	275					2.90
22	9.0	245					3.10
23	8.3	235					3.20

Kodaikanal (10°2'N, 77°5'E)		March 1961					
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	10.0	245					3.10
01	9.4	235					3.30
02	7.6	225					3.35
03	6.2	230					3.40
04	4.5	240					3.40
05	3.0	240					3.45
06	4.7	270					3.15
07	7.9	240	120		2.5	G	3.10
08	9.8	220	115	3.0			7.4 2.80
09	9.9	220	120				8.0 2.50
10	9.2	210	120				8.7 2.50
11	8.9	205	120				8.8 2.50
12	9.0	200	120				8.6 2.50
13	9.6	200	120				8.8 2.55
14	10.2	200	115				8.3 2.50
15	10.8	215	120				7.5 2.55
16	11.4	225	120	3.0			6.6 2.60
17	11.6	250					5.4 2.60
18	11.2	275					2.50
19	9.7	340					2.40
20	10.1	325					2.40
21	10.7	300					2.80
22	10.4	260					2.90
23	10.6	250					3.0 3.10

Time : 75.0°E

Sweep : 1.0 Mc. to 25.0 Mc. in 27 seconds

Astrophysical Observatory, Kodaikanal
 1 May 1961

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 Director, Astrophysical Observatory

The symbols and terminology used are in accordance with the recommendations of the Special Committee on World-wide Ionospheric Soundings to the U.R.S.I./A.G.I. in its first report (Brussels, 2 September 1956)

MAGNETIC OBSERVATORY, ALIBAG (BOMBAY)

Three-hourly indices of Geomagnetic Activity

(Scale values of variometers in γ/mm :

D=11.3; H=4.4; Z=3.0)

(K 9 = 300 γ)

Greenwich day	JANUARY 1961			FEBRUARY 1961			MARCH 1961		
	K-indices	Sum	Character of the day*	K-indices	Sum	Character of the day*	K-indices	Sum	Character of the day*
1	222 2111	12	Ca	1111 1121	9	Ca	2222 3122	16	Ca
2	2222 2211	14	Ca	2222 2111	13	Ca	2222 1123	15	Ca
3	1111 1212	10	Ca	1103 5332	18	M	3221 1221	14	Ca
4	0112 2212	11	Ca	2223 5376	30	G	2222 2211	14	Ca
5	2222 2132	16	Ca	3344 2221	21	S	1110 1354	16	Sa
6	2112 3202	13	Ca	3455 5523	32	Ma	4333 3211	20	S
7	2222 3223	19	S	1222 2224	17	S	2221 2222	15	Ca
8	3332 3553	27	M	3112 2333	18	S	2221 1223	15	Ca
9	3353 3234	26	M	1112 1101	8	Ca	1221 4345	22	M
10	1222 2211	13	Ca	1331 1122	14	S	4357 5421	31	G
11	1222 1000	8	Ca	2234 3221	19	S	2222 2231	16	Ca
12	1222 2222	15	Ca	1222 1111	11	Ca	2122 1122	13	Ca
13	1233 3232	19	Ca	2246 4442	28	Ma	2232 3322	19	Ca
14	1222 2222	15	Ca	1322 1223	16	Ca	3344 3332	25	S
15	2233 2225	21	M	2223 2211	15	Ca	2424 5323	25	M
16	2332 1133	18	S	3443 3211	21	S	3342 3211	19	Sa
17	2222 2222	16	Ca	1135 5455	29	Ma	243 2221	18	S
18	2243 5333	25	M	5333 4542	29	Ma	1220 3432	17	S
19	3223 3554	27	M	3223 4342	23	Sa	2443 3443	27	S
20	3323 4541	25	M	3233 3532	24	Ma	2233 3242	21	S
21	2334 5422	25	M	2222 4433	22	Sa	2332 2331	19	S
22	2335 4431	25	M	1222 2322	16	Ca	1333 2211	16	S
23	2111 1222	12	Ca	2222 2221	15	S	1222 3222	16	S
24	2443 3342	25	M	1423 1111	14	S	2212 2212	14	Ca
25	3324 3321	21	Sa	1121 1112	10	Ca	2212 2111	12	Ca
26	1323 3322	19	Sa	1111 2221	11	Ca	2333 3223	21	S
27	2222 2212	15	Ca	1221 2222	14	Ca	2332 3642	25	G
28	2222 2334	20	S	1233 2222	17	S	4333 3331	23	Sa
29	2212 3331	17	S				2222 3231	17	Ca
30	1212 0101	8	Ca				2232 2211	15	Ca
31	2222 1220	13	Ca				2222 2422	18	S

At Bombay, since 1883, a day is classed as (1) a quiet day, or day of (2) Small, (3) Moderate, (4) Great or (5) Very Great disturbance, the letters distinguishing the respective classes being, C, S, M, G and VG. For representing intermediate conditions of activity of the smaller period movements, sub-classifications Ca, Sa, Ma are used. Roughly speaking a storm having a range of over 225 γ in the variations of the horizontal force during the first twenty-four hours after its commencement is classed as "Very Great". It is "Great" if the range is between 150 γ and 225 γ , "Moderate", if the range is between 65 γ and 150 γ , "Small", if the range is less than 65 γ . The range is, however, not the only criterion used in assigning the character of a storm. The oscillations in the magnetograms are duly taken into account in determining the class to which a particular storm should belong.

The corresponding International Character figures can be determined from the following—

Bombay Character	International Character	Bombay Character	International Character
C	0	M	2
Ca		Ma	
S		G	
Sa	1	VG	2

Colaba, Bombay
17 June 1961

P. R. PISHAROTY
Director, Colaba and Alibag Observatories

DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3322 Å and 4536/3323 Å)

Assumed α (3112) = 1.233 and α' (3323) = 0.071

NEW DELHI

(Lat. 28°35'N, Long. 77°12'E)

Date	JANUARY 1961			FEBRUARY 1961			MARCH 1961		
	Hours (IST)	Ozone amount (cm-atmos)	State of Sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky
1	0911	0.262	<i>Cu</i> 5	No observation Cloudy			No observation Instrument defective		
2	1500	0.261	<i>Fs</i> 4	1535	0.265	(<i>Cu, Ci</i>) 7	"	"	"
3	1500	0.277	(<i>Cu, Cs</i>) 3	No observation Instrument defective			"	"	"
4	1500	0.254	Clear	"	"	"	"	"	"
5	1509	0.254	"	"	"	"	"	"	"
6	1517	0.246	"	"	"	"	"	"	"
7	1514	0.267	<i>Cs</i> 3	"	"	"	1614	0.258	Hazy
8	0904	0.235	<i>Ci</i> 3 <i>Cs</i> 2	"	"	"	1620	0.247	(<i>Ci, Cs</i>) 5
9	1532	0.259	<i>Ac</i> 4, (<i>Ci, Cc</i>) 2	"	"	"	1616	0.253	Clear
10	1521	0.265	Sl. hazy	"	"	"	0852	0.255	Hazy
11	1535	0.253	<i>Ac</i> 1	"	"	"	1629	0.262	Cloudy
12	1531	0.251	Clear	"	"	"	1644	0.259	"
13	1537	0.250	"	"	"	"	1626	0.265	<i>Sc</i> 7
14	1523	0.253	"	"	"	"	1624	0.250	<i>Sc</i> 4
15	1452	0.238	"	1552	0.249	Clear	1630	0.227	Sun behind <i>Sc</i>
16	1516	0.238	<i>Ci</i> 2	1559	0.243	"	1625	0.229	<i>Sc</i> 3, <i>Fc</i> T, <i>As</i> 2, (<i>Ci Cs</i>) 1
17	0952	0.234	<i>Cu</i> 4	1549	0.258	"	0823	0.243	<i>Cu</i> 1, <i>Ci</i> 3
18	1544	0.254	(<i>Ci, Cs</i>) 7	1607	0.247	"	1628	0.246	Thick haze
19	1542	0.258	Clear	1546	0.254	"	0835	0.246	"
20	1528	0.273	"	1548	0.275	"	1636	0.267	(<i>Cu, Sc</i>) 6
21	1531	0.265	"	1553	0.255	"	0820	0.250	(<i>Ci, Cs</i>) 2
22	1525	0.266	"	1547	0.257	"	1625	0.246	<i>Cu</i> 3, <i>As</i> 1, <i>Cs</i> 4
23	1501	0.249	"	1553	0.253	"	No observation Overcast		
24	1511	0.241	<i>Cs</i> 2	1554	0.258	"	1631	0.231	<i>Cu</i> 3
25	0917	0.239	Cloudy	1609	0.257	<i>Ci</i> 3	1631	0.270	<i>Ac</i> T
26	1458	0.247	Clear	1558	0.257	<i>Ci</i> T	0825	0.261	Clear
27	1503	0.265	"	0846	0.246	(<i>Ci, Cs</i>) 2	0805	0.263	"
28	0948	0.253	(<i>Ci, Cs</i>) 7	No observation Instrument defective			1637	0.255	<i>Ci</i> 3
29	0910	0.259	<i>Cu</i> 3, (<i>Ac, As</i>) 3, <i>Ci</i> 1	"	"	"	1641	0.250	<i>Ci</i> 7
30	No observation Cloudy			"	"	"	1642	0.269	Hazy
31	"	"	"	"	"	"	1652	0.289	<i>Ci</i> 2

NOTE—The cloud amounts are in oktas

DAILY OZONE DATA—INDIA

(Direct sun or zenith sky observation—AD)

$$\alpha (3055) = 1.882 \quad \alpha' (3254) = 0.120$$

$$\alpha (3176) = 0.391 \quad \alpha' (3398) = 0.017$$

AHMEDABAD

(Lat. 23°04'N, Long. 72°38'E)

Date	JANUARY 1961			FEBRUARY 1961			MARCH 1961		
	Hours (IST)	Ozone amount (cm-atmos)	State of sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky
1	09	0.217	Clear	09	0.246	Clear	16	0.238	Clear
2	09	0.226	"	09	0.242	"	16	0.246	"
3	16	0.240	"	09	0.245	"	16	0.226	"
4	16	0.229	"	No observation			No observation		
5	09	0.235	"	"	"	"	"	"	"
6	No observation			"	"	"	"	"	"
7	09	0.225	Clear	"	"	"	16	0.236	Clear
8	No observation			11	0.240	Clear	09	0.230	"
9	09	0.234	Clear	16	0.248	"	09	0.232	"
10	09	0.234	"	15	0.239	"	09	0.227	"
11	09	0.226	"	16	0.235	"	17	0.228	"
12	09	0.231	"	09	0.230	"	17	0.228	"
13	09	0.235	<i>Ac</i> 2	15	0.251	"	17	0.235	"
14	09	0.221	Mainly overcast	17	0.236	"	17	0.245	<i>Cs</i> 2
15	No observation			17	0.239	"	17	0.240	Clear
16	16	0.231*	Overcast	17	0.240	"	16	0.246	<i>Cs</i> 2
17	09	0.219	(<i>Ac</i> , <i>Cs</i>) 2	17	0.242	"	17	0.234	Dusty and hazy
18	09	0.221	Clear	16	0.248	"	17	0.239	"
19	16	0.226	"	17	0.244	"	No observation		
20	16	0.233	"	09	0.248	"	16	0.247	Thick <i>Ci</i>
21	09	0.238	"	11	0.239	"	09	0.234	Clear
22	No observation			10	0.228	"	09	0.239	"
23	15	0.237	<i>Cs</i> 2	No observation			09	0.240	"
24	09	0.237	Clear	09	0.237	Clear	09	0.239	Thin <i>Ci</i>
25	09	0.244	"	No observation			17	0.236	"
26	09	0.243	"	"	"	"	09	0.244	Clear
27	09	0.237	"	16	0.235	Clear	09	0.246	"
28	16	0.245*	Overcast	16	0.235	"	09	0.247	"
29	16	0.250	Mainly overcast	"	"	"	09	0.264	"
30	09	0.241	(<i>Ac</i> , <i>Cs</i>) 3	"	"	"	09	0.255	"
31	No observation			"	"	"	17	0.254	"

NOTE—The cloud amounts are in oktas
Instrument temporarily shifted to Anand for moon studies from 25 February to 6 March 1961

*Zenith sky observation

SOLAR GEOMAGNETIC IONOSPHERIC AND OZONE DATA

DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3323 Å and 4536/3323 Å)

Assumed α (3112) = 1.23 and α' (3323) = 0.08

KODAIKANAL

(Lat 10° 14'N, Long. 77° 28'E)

Date	JANUARY 1961			FEBRUARY 1961			MARCH 1961		
	Hours (IST)	Ozone amount (cm-atmos)	State of sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky	Hours (IST)	Ozone amount (cm-atmos)	State of sky
1	09	0.219	Cs 2	09	0.235	Ci 4	09	0.238	Hazy
2	08	0.221	Cu 1, Cs 3	09	0.237	Cs 1	09	0.243	Ci 1, hazy
3	09	0.218	Cu 2, Cs 4	09	0.242	Hazy	09	0.242	Ci 4
4	10	0.234	Cu 1, Ci 1	09	0.245	Ci 1, hazy	09	0.241	Hazy
5	No observation		Overcast, drizzle	No observation		Sc 7	09	0.237	Sc 2, Ci 1
6	"		Overcast, rain	09	0.242	Cs 6	09	0.235	Hazy
7	09	0.227	Cu 2	09	0.245	Cs 4	09	0.241	"
8	09	0.223	Cu 1, hazy	09	0.243	Cs 7	09	0.246	"
9	09	0.225	Cs 5	08	0.241	Ci 6	09	0.242	Ci T
10	No observation		Overcast, rain	No observation		Overcast	09	0.239	Clear
11	"		"	09	0.247	Ci 4	09	0.247	Ci 1
12	"		Overcast, drizzle	08	0.241	Ci 3	09	0.247	Cs 7
13	"		"	No observation		Overcast	09	0.245	Cs 3
14	09	0.226	Cs 6	"		"	11	0.254	Cs 7
15	No observation		Overcast, rain	"		Overcast, drizzle	09	0.234	Hazy
16	"		"	"		"	09	0.235	"
17	16	0.225	Cu 1, Cs 4	10	0.241	Ci 5	09	0.239	Cs 2
18	16	0.225	Ac 1, Cs 6	11	0.255	Cs 7	09	0.247	Hazy
19	No observation		Overcast, drizzle	09	0.245	Cs 4	09	0.242	Cs 4
20	"		Overcast	09	0.239	Ac 2	09	0.241	Hazy
21	09	0.219	Sc 4, Ac 2	No observation		Overcast	09	0.242	"
22	08	0.222	Ac 4	16	0.242	Cs 5	09	0.238	"
23	16	0.226	Cu 2, Ac 1	09	0.235	Cs 2	09	0.238	"
24	09	0.231	Cu 1, Cs 1	09	0.239	Clear	08	0.235	Cs 5
25	09	0.227	Ci 1, hazy	09	0.241	Ci 1, hazy	08	0.234	Cs 3
26	09	0.226	Hazy	09	0.241	Ci 1	09	0.241	"
27	09	0.231	Ci 1, hazy	09	0.235	"	08	0.247	Hazy
28	09	0.230	Ci T, hazy	09	0.239	Ci 3	08	0.246	"
29	09	0.234	"				08	0.247	"
30	09	0.231	Ci 2, hazy				08	0.246	Cs 3
31	No observation		As 7				No observation		Sc 7, drizzle

NOTE—The cloud amounts are in oktas