

SOLAR, GEOMAGNETIC, IONOSPHERIC AND OZONE DATA

KODAIKANAL SOLAR, GEOMAGNETIC AND IONOSPHERIC DATA

(APRIL—JUNE 1960)

Curves showing (a) Kodaikanal daily relative sunspot numbers, (b) daily areas of calcium prominences and (c) daily areas of H-alpha dark markings are given on page 400. Tables 1 to 4 below 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 5.

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)
11855	29°N	May 8	656*
11862	10°S	May 19	964*
11865	14°N	May 25	584*

*Increased in area after central meridian passage

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					
Apr 1	02	42	02	47	03	00	11° N	20° W	1	1.7	Observed both in spectro- helioscope and on spec- troheliogram
Apr 3(i)	*03	17	03	17	03	22	12° N	33° W	2	1.7	Do.
3(ii)	05	42	05	44	05	52	12° N	35° W	1	1.6	Do.
Apr 4	*02	18	02	21	02	34	12° N	50° W	2	1.4	Do.
Apr 5	*02	15	02	45	03	08	12° N	62° W	2	1.4	Do.
Apr 9	*02	09	04	04	05	05	10° N	22° W	3	2.04	Do.†
May 25	*02	35	02	35	02	58	12° N	06° E	1	2.0	Do.
Jun 20	05	10	05	20	05	25	31° N	56° W	2	1.7	Do.

*Time of first observation of flare and not the beginning

†The Spot remained bright from 02 09 to 05 30 hours ; observations were interrupted by bad sky

TABLE 5

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— $7\frac{1}{2}$, 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 values)
 Kodaikanal (10°2'N, 77°5'E) April 1960

Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	11.6	250					4.1 3.00
01	10.6	250					.. 3.00
02	9.6	240					.. 3.05
03	9.2	240					.. 3.10
04	7.6	230					.. 3.30
05	5.0	225					.. 3.35
06	7.2	260					.. 3.20
07	10.5	240	..	120	2.8	6.6	3.10
08	11.9	230	..	110	3.4	11.0	2.80
09	12.3	220	..	..	..	12.0	2.45
10	11.4	210	..	..	..	12.6	2.35
11	10.8	210	..	..	..	12.7	2.35
12	11.0	205	..	..	..	12.8	2.35
13	11.4	205	..	..	..	12.4	2.35
14	12.0	210	..	115	..	12.0	2.35
15	12.8	220	..	110	3.6	10.0	2.40
16	13.0	240	..	110	..	9.2	2.40
17	13.0	255	..	120	..	7.6	2.35
18	12.6	290					.. 2.30
19	11.2	380					.. 2.15
20	11.4	350					.. 2.35
21	11.6	325					4.0 2.50
22	12.5	300					3.2 2.65
23	12.4	260					4.0 2.90

Ionospheric data (Median values)
 Kodaikanal (10°2'N, 77°5'E) May 1960

Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	10.1	280					3.9 2.90
01	8.4	290					4.6 2.80
02	8.4	300					.. 2.80
03	8.6	255					6.6 3.00
04	6.9	225					.. 3.20
05	5.2	220					.. 3.30
06	7.4	260		125	2.1	G	3.10
07	10.0	240	..	115	2.8	8.2	2.95
08	11.2	220	..	115	..	10.8	2.70
09	11.5	215	..	110	..	11.4	2.40
10	11.0	205	..	..	..	12.0	2.35
11	11.0	205	..	..	..	12.2	2.30
12	10.7	200	..	..	..	12.2	2.30
13	10.8	200	..	..	..	12.2	2.30
14	10.8	210	..	115	..	12.0	2.30
15	11.0	220	..	110	..	11.2	2.35
16	11.6	230	..	110	..	9.6	2.40
17	12.2	255	..	120	2.6	7.6	2.45
18	12.2	280		..			7.3 2.45
19	11.1	340					4.1 2.40
20	10.7	340					2.4 2.40
21	10.3	345					4.5 2.40
22	10.4	325					3.7 2.60
23	10.5	300					3.2 2.80

Kodaikanal (10°2'N, 77°5'E) June 1960

Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2
00	8.0	300					4.0 2.80
01	7.0	300					5.0 2.75
02	6.4	310					3.3 2.65
03	5.8	310					3.6 2.65
04	4.9	280					.. 2.85
05	4.8	260					.. 3.00
06	7.4	260	..	120	..	G	3.00
07	9.6	240	..	115	2.9	7.0	2.90
08	10.7	225	..	110	3.4	8.7	2.70
09	11.1	220	..	110	..	10.8	2.50
10	10.8	210	..	..	..	11.6	2.30
11	10.7	210	..	..	..	11.8	2.30
12	10.7	210	..	..	..	11.6	2.20
13	10.5	200	..	..	..	11.4	2.25
14	10.9	220	..	115	..	11.0	2.25
15	11.4	220	..	115	..	9.6	2.30
16	11.8	235	..	115	3.2	8.3	2.35
17	12.4	255	..	120	2.6	6.8	2.45
18	12.0	280	..	..	..	6.0	2.60
19	11.4	320					4.1 2.50
20	10.3	320					4.4 2.45
21	9.6	345					3.8 2.50
22	9.6	320					3.1 2.60
23	9.5	300					2.8 2.70

Time : 75°0'E

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

Astrophysical Observatory, Kodaikanal

1 August 1960

M. K. VAINU BAPPU

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)

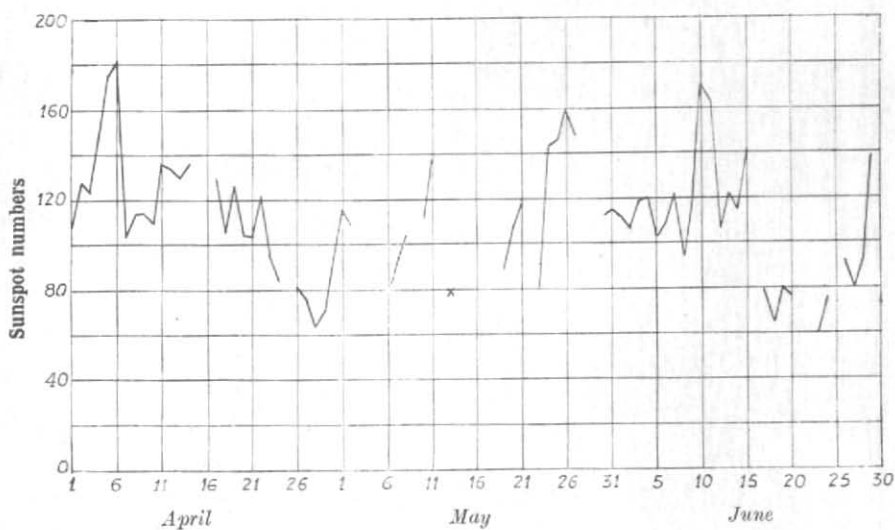


Fig. 1(a). Kodaikanal daily relative sunspot numbers

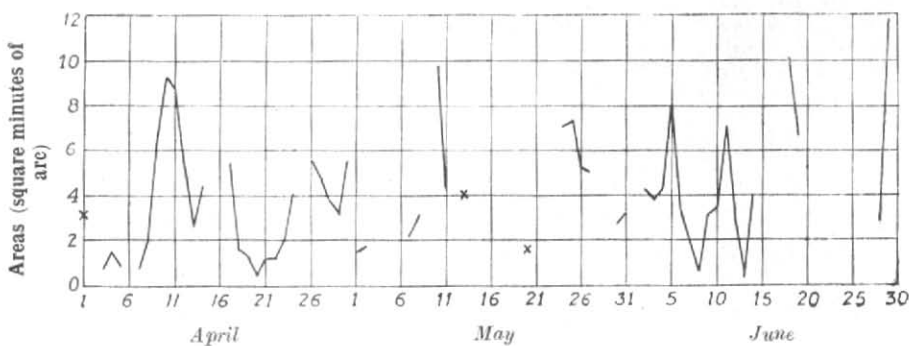


Fig. 1(b). Daily areas of calcium prominences

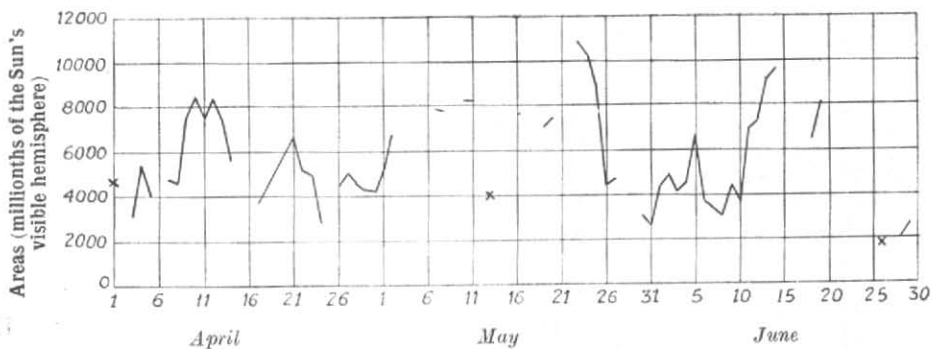


Fig. 1(c). Daily areas of H-alpha dark markings

NOTE--Breaks in the graphs are due to lack of observations

MAGNETIC OBSERVATORY, ALIBAG (BOMBAY)

Three hourly indices of Geomagnetic Activity

(Scale values of variometers γ /mm:

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

(K 9=300 γ)

Greenwich day	APRIL 1960				MAY 1960				JUNE 1960			
	K-indices	Sum	Character of the day*		K-indices	Sum	Character of the day*		K-indices	Sum	Character of the day*	
1	7788	7876	58	G	7665	3323	35	G	3455	4221	26	M
2	3344	4224	26	M	3322	2222	18	Sa	2233	2221	17	S
3	6554	3232	30	Ma	2222	1121	13	S	1122	2233	16	S
4	3433	4223	24	Sa	1111	1122	10	Ca	5554	3334	32	Ma
5	4651	4431	28	M	2222	2122	15	Ca	3333	4232	23	S
6	1232	2522	19	Sa	3344	3465	32	G	3334	2222	21	S
7	2222	2554	24	M	5545	6442	35	G	3233	2132	19	S
8	2343	3322	22	Sa	2556	7666	43	G	1332	2234	20	S
9	3422	2111	16	Sa	4545	2222	26	Ma	3332	2221	18	S
10	4443	4355	32	Ma	1222	2223	16	Ca	1222	1222	14	Ca
11	4332	3323	23	Sa	3552	2233	25	M	2121	1111	10	Ca
12	3343	2222	21	Sa	2444	3222	23	Sa	2333	1221	17	Ca
13	3432	2222	20	Sa	2523	2232	21	M	1221	2111	11	Ca
14	3233	2222	19	S	3232	2212	17	S	1224	4231	19	S
15	3422	2221	18	S	1223	2111	13	Ca	2132	2222	16	Ca
16	2223	4532	23	M	1223	5565	29	G	2221	1111	11	Ca
17	3333	2332	22	S	4244	4211	22	M	1100	1322	10	Ca
18	3233	2311	18	S	1222	2122	14	Ca	3234	3322	22	S
19	1111	2101	8	Ca	2322	1111	13	S	2322	2222	17	Ca
20	0111	1101	6	C	1102	1111	8	Ca	2122	3211	14	Ca
21	1111	1111	8	Ca	0122	2111	10	Ca	3323	3322	21	S
22	1222	2211	13	Ca	1111	3222	13	Ca	2222	2223	17	Ca
23	1332	2245	22	M	1122	3543	21	M	3232	2322	19	S
24	6533	4224	29	G	3442	2233	23	Sa	2222	2232	17	S
25	4444	5523	31	Ma	3322	4232	21	Sa	3233	2433	22	S
26	2232	2322	18	Ca	3222	1333	19	S	2332	2223	19	S
27	2221	2245	20	Sa	3321	2232	18	S	5543	2434	30	M
28	6454	4362	34	G	2222	2155	21	M	4556	2232	29	G
29	4444	3222	25	M	6354	5344	34	G	2442	3346	28	Ma
30	5335	9966	46	VG	3334	3212	21	S	5423	3553	30	M
31					2244	3323	23	S				

*At Bombay, since 1883, a day is classed as (1) a quiet day, or a 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 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" when it 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 } Ca }	0	M } Ma }	2
S } Sa }		G } VG }		2
	1		

Colaba, Bombay
5 August 1960

P. R. PISHAROTY
Director, Colaba and Alibag Observatories

DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3323 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	APRIL 1960			MAY 1960			JUNE 1960		
	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	17	0.257	Hazy	17	0.265	Clear	17	0.255	Hazy
2	17	0.257	<i>Ci</i> T	17	0.259	Hazy	17	0.251	<i>Ac</i> 3, hazy
3	17	0.267	Clear	17	0.277	„	17	0.262	<i>Ac</i> 2, hazy
4	17	0.273	Hazy	17	0.261	Dust haze	17	0.246	(<i>Ci</i> , <i>Cs</i>) 2
5	17	0.301	(<i>Cu</i> , <i>Cb</i>) 2, <i>As</i> 1, <i>Ci</i> T	17	0.270	Clear	08	0.257	Hazy
6	17	0.278	(<i>Ci</i> , <i>Cs</i>)	17	0.261	<i>Ci</i> T	08	0.257	„
7	17	0.274	(<i>Ci</i> , <i>Cs</i>) 6	17	0.258	Hazy	17	0.246	(<i>Ci</i> , <i>Cs</i>) 2
8	17	0.301	(<i>Cu</i> , <i>Sc</i>) 6, <i>Ac</i> 1, <i>Ci</i> 1	17	0.274	Clear	17	0.225	(<i>Ac</i> , <i>Ci</i>) T
9	08	0.285	Hazy	17	0.245	„	17	0.227	Hazy
10	No observation	Cloudy		17	0.246	„	17	0.249	„
11	17	0.279	Hazy	17	0.263	„	17	0.257	Dust haze
12	08	0.254	(<i>Ci</i> , <i>Cs</i>) 1	17	0.262	(<i>Ci</i> , <i>Cs</i>) 3	08	0.239	Hazy
13	17	0.269	<i>As</i> 2, (<i>Ci</i> , <i>Cs</i>) 5	17	0.261	(<i>Ci</i> , <i>Cs</i>) 2	17	0.245	<i>Sc</i> 3, (<i>Ci</i> , <i>Cs</i>) 2
14	17	0.257	(<i>Ci</i> , <i>Cs</i>) 3	17	0.262	(<i>Sc</i> , <i>Cu</i>) 1, (<i>Ci</i> , <i>Cc</i>) 2	17	0.230	Hazy
15	17	0.283	(<i>Ci</i> , <i>Cs</i>) 6	17	0.275	(<i>Ci</i> , <i>Cs</i> , <i>Cc</i>) 7	17	0.267	<i>Sc</i> 2
16	No observation	Cloudy		17	0.263	<i>Cu</i> 4, <i>Ac</i> 2	No observation	Cloudy	
17	08	0.265	(<i>Sc</i> , <i>Cu</i>) 6, <i>As</i> 2	17	0.262	(<i>Ci</i> , <i>Cc</i>) 5	17	0.258	Clear
18	17	0.273	<i>Sc</i> 3, <i>Ac</i> 3	17	0.249	(<i>Sc</i> , <i>Cu</i>) 4	17	0.261	<i>Ac</i> 2
19	17	0.286	(<i>Ci</i> , <i>Cs</i>) 3	17	0.255	Hazy	17	0.282	Cloudy
20	17	0.282	(<i>Ci</i> , <i>Cs</i>) 4	17	0.245	(<i>Sc</i> , <i>Cu</i>) 4	17	0.247	Hazy
21	08	0.273	Clear	17	0.254	Clear	17	0.274	„
22	1230	0.277	(<i>Sc</i> , <i>Cu</i>) 6, <i>As</i> 2	17	0.285	Hazy	17	0.258	<i>Ac</i> 3
23	17	0.281	<i>Ac</i> 3	17	0.257	„	17	0.247	<i>Cu</i> 4
24	17	0.275	<i>Cu</i> 5	17	0.277	<i>Sc</i> 2, <i>Ac</i> 3	08	0.235	(<i>Cu</i> , <i>Sc</i>) 2
25	17	0.275	<i>Cu</i> 3	08	0.261	Hazy	17	0.243	(<i>Ci</i> , <i>Cs</i>) 2
26	17	0.270	Clear	17	0.257	Clear	08	0.241	<i>Sc</i> 4, <i>Cu</i> 2
27	17	0.277	„	17	0.257	(<i>Cu</i> , <i>Ac</i>) 4	17	0.265	(<i>Ci</i> , <i>Cs</i>) 3
28	17	0.297	<i>Ac</i> 4	17	0.291	<i>Cu</i> 5	17	0.267	<i>Cu</i> 2, (<i>Ci</i> , <i>Cs</i>) 1
29	17	0.273	Hazy	08	0.262	<i>As</i> 8	08	0.281	(<i>Cu</i> , <i>Ac</i>) 2, (<i>Ci</i> , <i>Cs</i>) 1
30	17	0.289	Clear	17	0.258	Hazy	08	0.246	(<i>Ci</i> , <i>Cs</i>) 5
				17	0.247	„			

NOTE—The cloud amounts are in oktas

DAILY OZONE DATA—INDIA

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

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

AHMEDABAD

(Lat. 23°04'N, Long. 72°38'E)

Date	APRIL 1960			MAY 1960			JUNE 1960		
	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	0.255	Clear	No observation		Overcast	09	0.278	(Ac, Cs) 2, hazy
2	09	0.261	"	09	0.269	Clear	09	0.282	Thin Ci
3	09	0.262	"	09	0.270	"	09	0.278	(Ac, Cs) 2
4	08	0.271	"	09	0.266	"	09	0.270	Mainly overcast
5	09	0.270	"	09	0.277	"	No observation		Overcast
6	09	0.263	"	09	0.274	"	09	0.273	(Cu, Ci, Cs) 2
7	09	0.258	"	08	0.266	"	09	0.267	Overcast
8	09	0.270	"	09	0.267	"	09	0.265	"
9	09	0.275	"	09	0.259	"	09	0.263	(Ci, Cs) 2
10	09	0.273	Thin Ci	09	0.263	"	09	0.262	(Cu, Ci) 2
11	09	0.263	Clear	09	0.263	"	09	0.262	Overcast
12	09	0.254	"	15	0.247	Thick Ci	09	0.270	"
13	09	0.261	"	17	0.266	"	09	0.270	"
14	09	0.257	"	17	0.267	Mainly overcast	No observation		"
15	09	0.266	(Ci, Cs) 3	No observation		"	09	0.269	Mainly overcast
16	No observation		Overcast	09	0.262	"	No observation		Overcast
17	09	0.266	Cs T	09	0.261	(Ac, Cs) 2	"		"
18	09	0.263	Clear	No observation		Overcast	"		"
19	09	0.277	"	09	0.271	(Cu, Ci) 2	09	0.270	Mainly overcast
20	09	0.278	"	09	0.271	Clear	09	0.273	"
21	09	0.275	"	09	0.270	"	09	0.262	"
22	09	0.273	"	09	0.274	"	09	0.267	"
23	09	0.271	"	09	0.279	"	09	0.255	"
24	No observation			09	0.278	"	No observation		Overcast
25	09	0.262	Clear	09	0.281	(Ac, Ci) 3	"		"
26	09	0.262	"	09	0.278	Clear	"		"
27	09	0.263	"	09	0.275	(As, Ci) 3	09	0.259	Thick Ci
28	09	0.267	"	09	0.275	(As, Ci) 3	No observation		Rain
29	09	0.263	"	09	0.279	Thick Ci	08	0.261	(Cu, Ci) 2
30	No observation		Overcast	09	0.277	Thin Ci, hazy	No observation		Overcast
31				09	0.273	Hazy			

NOTE—The cloud amounts are in oktas

DAILY OZONE DATA—INDIA

(From direct sun observations on 3112/3323 Å and 4536/332Å)

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

KODAIKANAL

(Lat. 10° 14'N, Long. 77° 28'E)

Date	APRIL 1960			MAY 1960			JUNE 1960		
	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	08	0.239	Ci 2, Cs 4	09	0.254	Cs 6	No observation		Sc 7, drizzle
2	No observation		Overcast	08	0.243	Cu T, Ci 1	07	0.259	Cs 3, Ci 2
3	" (Power failure)		Cu 6, Sc 1	No observation		Overcast, drizzle	08	0.263	Ci 3
4	08	0.239	Cu 1, Ci 1	"	"	"	08	0.261	Ci 3
5	08	0.239	Ac 1, Ci 2, Cs 4	"		Overcast, rain	08	0.265	Cs 3
6	No observation		Sc 6, Ac 1	"		Overcast	No observation		Cu 2, Sc 5
7	08	0.245	Ac 1, Ci 2	"		Ac 6, Ci 1	07	0.259	Sc T, Ci 3
8	09	0.255	Ac 1, Ci 1	08	0.253	Cu T, Cs 1	No observation		Ci 2, Cs 5 (thick)
9	09	0.258	Ci 2, Cs 4	No observation		Overcast	"		Cu 7
10	08	0.254	Ci 2, hazy	08	0.251	Cu T, Cs 2	08	0.255	Sc T, Ac 2
11	08	0.246	Hazy	No observation		Overcast, drizzle	10	0.257	Sc 2, Cs 4
12	No observation		Overcast	"		Overcast	10	0.255	Sc 1, Ac 1, Cs 5
13	08	0.251	Hazy	"		"	08	0.250	Ac 1, Cs 3
14	08	0.246	Ci 2, Cs 4	"		"	08	0.251	Ci 3
15	No observation		Overcast, drizzle	"		"	No observation		Sc 1, Ac 6, rain
16	"		Overcast	"		Overcast, drizzle	"		Overcast
17	09	0.245	Cs 5	"		"	"		Overcast, rain
18	09	0.249	Ci 1, Cs 3	"		Overcast, rain	09	0.257	Sc T, Ac 2, Ci 1
19	No observation		Overcast, rain	"		Sc 7, rain	08	0.250	Cs 6
20	08	0.241	Ci 5	08	0.258	Cu T, Cs 5	No observation		Overcast
21	08	0.238	Ac 1, Cs 5	No observation		Overcast, drizzle	"		"
22	No observation		Ac 7	"		"	"		"
23	10	0.250	Cu 1, Ci 2	"		Cu 3, Ac 4	"		"
24	No observation		Overcast	"		Cu 3, Sc 4	"		"
25	"		Overcast, drizzle	08	0.261	Cs 3	"		"
26	10	0.255	Cu 1, Ci 3	08	0.257	Cs 6	"		"
27	08	0.250	Ci 2	09	0.263	Cs 4, Ci 4	"		"
28	08	0.249	Cs 2	No observation		Overcast	10	0.265	Ci 4, Cs 4
29	08	0.254	Cs 3	"		Overcast, rain	10	0.266	Ci 3, Cs 4
30	08	0.255	Cs 3	16	0.278	Sc 4, Cs 4	No observation		Overcast
31				08	0.266	Ci 3			

NOTE—The cloud amounts are in oktas