

SOLAR, GEOMAGNETIC, IONOSPHERIC AND OZONE DATA

KODAIKANAL SOLAR, GEOMAGNETIC AND IONOSPHERIC DATA

(JULY- SEPTEMBER 1959)

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 88. 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. A diagram showing the times of rising and setting of the sun and planets at Kodaikanal for 1960 is given in plate facing page 88.

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)
11565	16° N	Jul 14	1072
11579	11° N	Jul 31	1368
11604	06° N	Aug 25]	1180
11616	22° N	Aug 27	409*
11619	12° S	Aug 29	992
11633	07° N	Sep 11	790**

*Increased in area after central meridian passage

** Area as measured on 13 September

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					
Jul 14	05 23*	—	—	15° N	05° E	3+	—	The flare was noticed in the H- α spectroheliogram taken at 0523 and 0527 U.T. through thick sky
Aug 14	02 10	02 15	02 20	12° N	27° E	1	1.6	Observed in spectrohelioscope and spectroheliograph

*Not the time of the beginning of the flare, but the time when it was first noticed in H-alpha spectroheliograms

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	Sep 19 0500	21° S	15° E	Actual disintegration not observed

TABLE 4

Principal magnetic storms

Greenwich date 1959	Storm-time				Sudden commencement			C-figure degree of activity ⁴	Maximal activity Greenwich day	Ranges			
	GMT of beginning		GMT of ending ¹		Type ²	Amplitude ³				D	H	Z	
	h	m	d	h		γ	γ						γ	γ
Jul 11	16	28	12	14	s.c.	2	88	46	m	11	7	168	92
Jul 15	08	02	16	23	s.c.	3	118	29	s	15	18	785	184
Jul 17	16	38	19	11	s.c.	4	150	69	ms	18	10	327	121
Aug 16	04	01	17	22	s.c.	1	30	12	s	16	13	539	109
Aug 20	04	10	21	20	s.c.	2	130	35	ms	20	6	274	67
Sep 3	22	00	5	10	s.c.	1	34	20	m	4	8	226	86
Sep 20	11	52	22	18	s.c.	<1	19	9	ms	21	8	252	76

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

1. Approximate time of ending of storm construed as the time of cessation of reasonably marked disturbance movements in the traces
2. s.c. = sudden commencement g.c. = gradual commencement
3. Signs of amplitudes of *D* and *Z* taken algebraically;
(*D*—reckoned negative being westerly)
(*Z*—reckoned positive being vertically downwards)
4. 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 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 instrument 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 values)

Kodaikanal (10.2°N, 77.5°E)							July 1959	
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2	
00		8.5	340				4.3	2.70
01		8.4	320				4.2	2.70
02		8.3	310				6.0	2.70
03		7.2	290				2.9	2.80
04		7.0	250				..	3.00
05		5.4	240				..	3.15
06		7.8	270		120	2.2	G	3.00
07	..	10.3	245	..	110	3.0	8.0	2.85
08	..	11.2	230	..	110	..	11.4	2.60
09	..	11.6	220	..	..	..	12.4	2.35
10	..	11.6	210	..	..	..	13.6	2.20
11	..	11.4	205	..	..	..	13.7	2.20
12	..	11.2	200	..	..	..	13.5	2.20
13	..	11.1	210	..	..	..	13.7	2.15
14	..	11.2	220	..	..	..	13.8	2.10
15	..	11.0	225	..	115	3.8	11.7	2.20
16	..	11.4	240	..	115	..	10.8	2.25
17	..	12.1	255	..	120	2.9	9.0	2.40
18	..	12.0	280	..	..	..	6.9	2.40
19		11.3	340				4.0	2.30
20		10.4	390				3.4	2.25
21		9.4	380				2.8	2.30
22		9.6	365				4.0	2.50
23		9.3	350				4.0	2.60

Kodaikanal (10.2°N, 77.5°E)								August 1959	
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2		
00			11.0	300			4.4	2.65	
01		U9.8	280				3.2	U2.80	
02		9.0	265				3.6	2.70	
03		8.4	260				..	2.85	
04		8.1	240				4.0	3.05	
05		6.0	230				..	3.10	
06		7.6	270				..	3.00	
07	..	10.5	245	..	115	3.0	8.4	2.90	
08	..	11.7	230	..	110	..	11.0	2.60	
09	..	12.1	220	..	110	..	11.6	2.30	
10	..	11.7	210	..	..	..	12.6	2.20	
11	..	11.4	210	..	..	..	12.8	2.15	
12	..	11.6	210	..	..	..	12.7	2.15	
13	..	11.6	215	..	..	..	12.9	2.10	
14	..	11.7	220	..	..	..	12.7	2.10	
15	..	12.0	225	..	115	..	11.6	2.15	
16	..	12.4	240	..	120	..	11.4	2.25	
17	..	12.4	260	..	120	..	9.0	2.30	
18	..	12.8	295	..	..	..	6.4	2.30	
19		11.6	380				4.3	2.10	
20		11.5	400				3.0	2.15	
21		U11.2	340				4.3	U2.40	
22		U11.2	320				5.0	U2.30	
23		U11.4	305				5.5	U2.60	

Kodaikanal (10.2°N, 77.5°E)								September 1959	
Time (hrs)	h'F2	foF2	h'F	foF1	h'E	foE	foEs (M3000) F2		
00			12.7	270			4.6	2.90	
01			11.6	245			..	2.95	
02		U10.0	240				..	U3.05	
03		9.0	240				..	3.05	
04		7.9	240				..	3.10	
05		5.4	240				..	3.20	
06		7.8	270				..	3.00	
07	..	11.0	250	..	115	2.8	8.5	2.90	
08	..	12.5	230	..	110	..	11.0	2.50	
09	..	12.6	220	..	110	..	11.8	2.25	
10	..	11.8	220	..	..	..	12.8	2.20	
11	..	11.7	215	..	..	..	13.0	2.20	
12	..	11.7	210	..	..	..	12.6	2.15	
13	..	11.8	215	..	115	..	12.8	2.10	
14	..	12.2	220	..	..	..	13.0	2.20	
15	..	12.6	230	..	110	..	11.6	2.20	
16	..	13.0	250	..	110	..	10.3	2.25	
17	..	13.2	270	..	120	..	8.6	2.25	
18		12.7	320				U4.6	2.20	
19		11.4	420				..	2.00	
20		U10.8	380				..	U2.05	
21		U11.7	330				..	U2.25	
22		U12.8	300				4.0	U2.40	
23		U12.6	290				5.0	U2.60	

Time : 75.0°E
Sweep : 1.0 Mc. to 25.0 Mc. in 27 seconds

Kodaikanal Observatory, Kodaikanal
2 November 1959

A. K. DAS
Deputy Director General of Observatories

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)

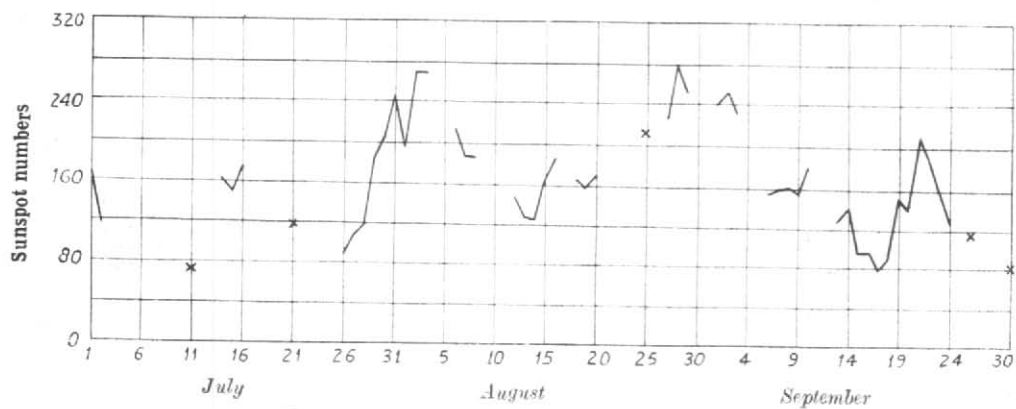


Fig. 1(a). Kodaikanal daily relative sunspot numbers

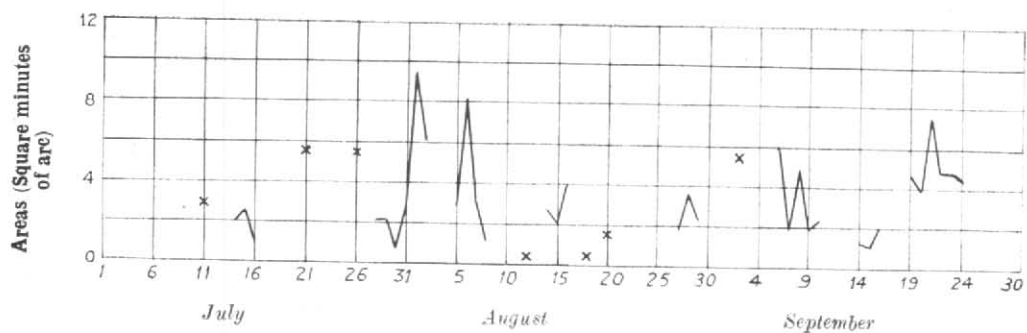


Fig. 1(b). Daily areas of calcium prominences

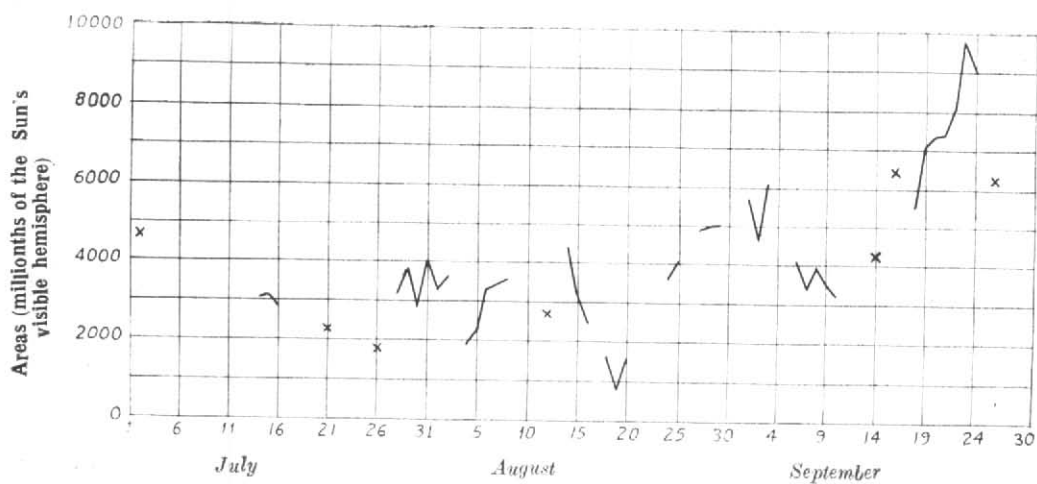
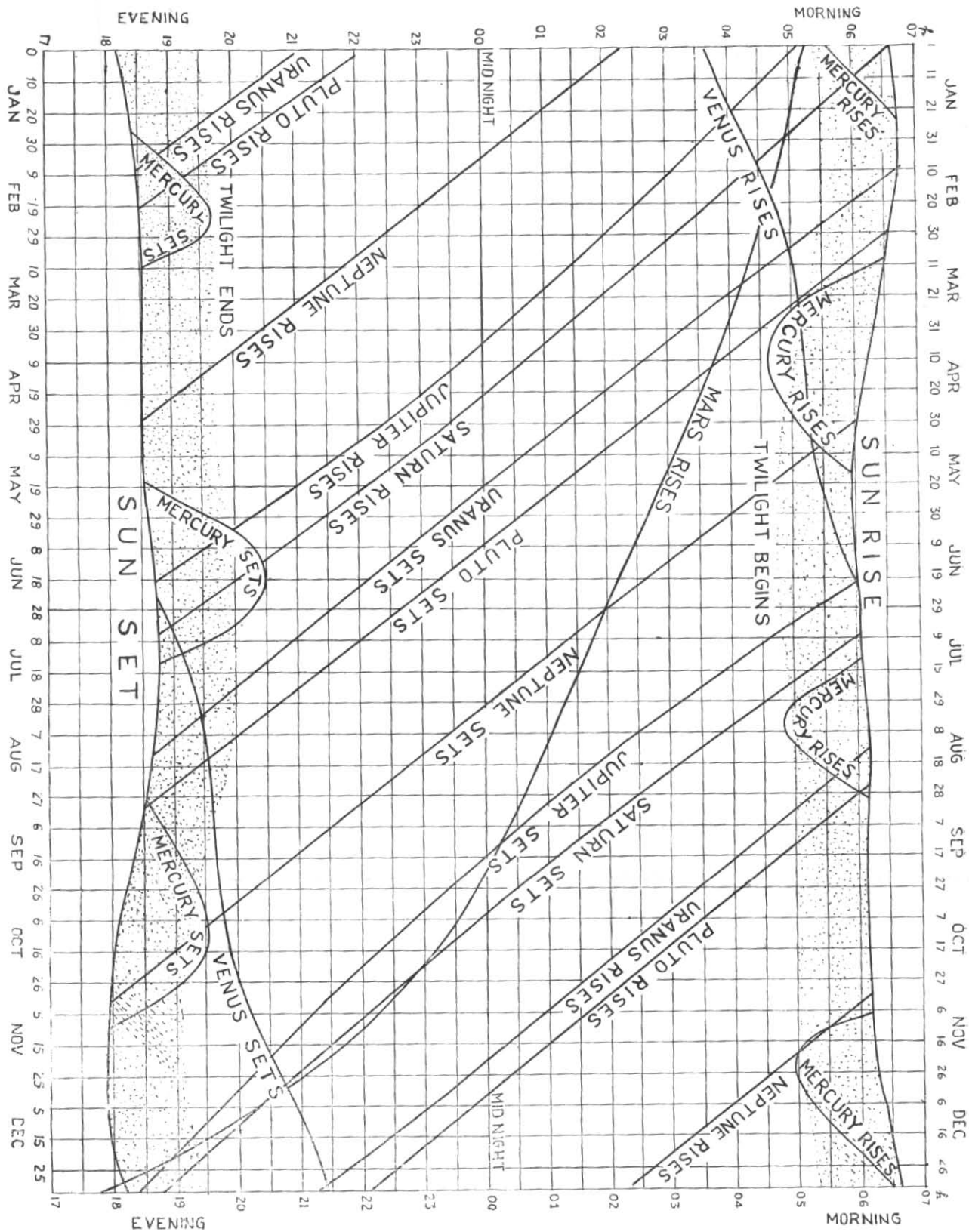


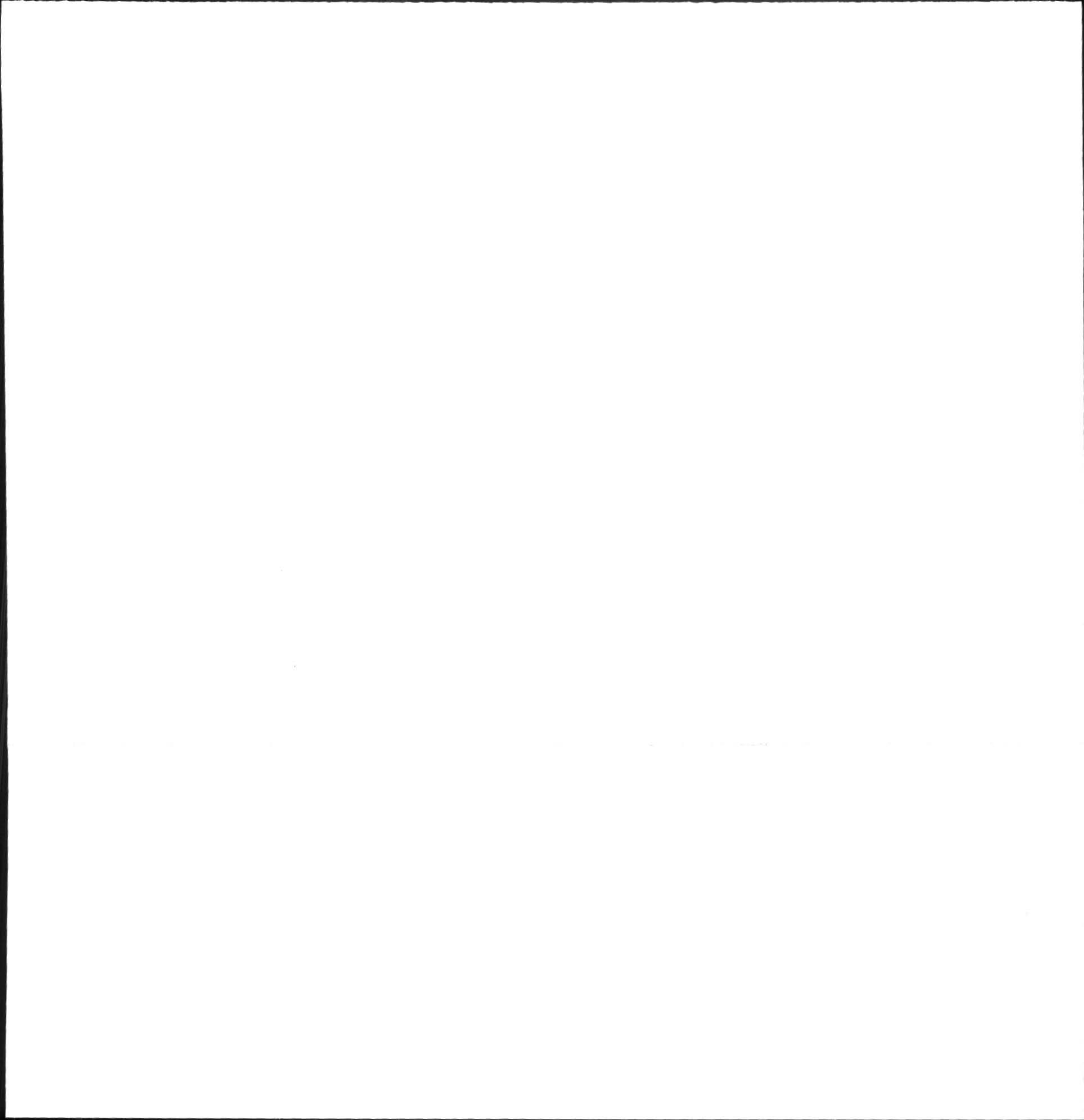
Fig. 1(c). Daily areas of H-alpha dark markings

Note—Breaks in the graphs are due to lack of observations



Times (IST) of rising and setting of the sun and planets at Kodalkanal ($10^{\circ}14'N$, $77^{\circ}28'E$) for 1960

(Plate to face page 88 of Vol. 11, No. 1)



MAGNETIC OBSERVATORY, ALIBAG (BOMBAY)

Three-hourly indices of Geomagnetic Activity

(Scales values of variometers in γ /mm:

D=11.3; H=4.4; Z=2.5)

(K 9 = 300 γ)

Greenwich day	JULY 1959				AUGUST 1959				SEPTEMBER 1959			
	K-indices		Sum	Character of the day*	K-indices		Sum	Character of the day*	K-indices		Sum	Character of the day*
1	1121	2112	11	Ca	3342	2222	20	S	2232	3352	22	S
2	2332	2211	16	Ca	3222	2231	17	S	3244	2234	24	Sa
3	1132	3221	15	Ca	2344	2322	22	Sa	4332	2436	27	M
4	1124	2333	19	Sa	2224	2323	20	S	4445	5445	35	M
5	3433	3232	23	Sa	1232	2222	16	Ca	3433	3333	25	Sa
6	2221	2222	15	Ca	3223	3552	26	M	3232	2211	16	S
7	2233	2221	17	S	4334	2342	25	Sa	2222	1321	15	Ca
8	1222	2222	15	Ca	2222	3212	16	Ca	1223	3432	20	S
9	2322	3232	19	S	3344	3332	25	S	1222	2212	14	Ca
10	4322	2112	17	S	3322	2222	18	S	2222	2222	16	Ca
11	2322	3655	28	M	2322	1201	13	Ca	2334	2222	20	S
12	4222	3222	19	S	1222	1111	11	Ca	3322	2221	17	S
13	1222	2212	14	Ca	1222	1121	12	Ca	3222	2124	18	S
14	1134	2221	16	S	2233	2222	18	S	2433	3222	21	S
15	2376	7887	48	G	2222	4343	22	S	2233	2233	20	S
16	5432	2232	23	Sa	3577	5545	41	G	3322	3242	21	S
17	1233	4877	35	G	6543	4543	34	M	2223	3334	22	S
18	6554	3624	35	G	2433	4442	26	Sa	2233	4233	22	S
19	3222	2222	17	S	2323	2242	20	S	5344	3223	26	Sa
20	2222	2222	16	Ca	2665	3254	33	Ma	3434	5464	33	M
21	2222	3232	18	S	3434	2333	25	Sa	4534	6643	35	M
22	2332	2222	18	S	2342	2333	22	S	4443	4241	26	Sa
23	3233	3122	19	S	2333	3422	22	S	2232	3444	24	S
24	2325	2243	23	S	3343	2212	20	S	4233	5332	25	S
25	3333	3344	26	Sa	2232	2213	17	S	2333	4524	26	S
26	2322	2343	21	S	2232	2221	16	Ca	2233	4343	24	S
27	2434	3232	23	S	2221	1111	11	Ca	2434	4433	27	S
28	2334	3222	21	S	0211	1112	9	Ca	2223	3232	19	Ca
29	2332	1111	14	Ca	3222	2321	17	S	2223	2223	18	Ca
30	2211	1222	13	Ca	2223	2231	17	S	2224	4332	22	S
31	2223	3222	18	S	2223	2333	20	Ca				

*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 and Ma are used. Roughly speaking a storm having a range over 225 γ in the variations of the horizontal force during the first twentyfour 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
29 October 1959

P. R. PISHAROTY
Director, Colaba and Alibag Observatories

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) = 1.233 and α' (3323) = 0.071

NEW DELHI

(Lat. 28°35'N, Long. 77°12'E)

Date	JULY 1959			AUGUST 1959			SEPTEMBER 1959		
	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	0.274	Sc 1, (Ac, As) 4, (Ci, Cs) 1	07	0.234	(Sc, Cu) 5, Ci 1	16	0.243	(Sc, Cu) 5
2	18	0.251	Cu 2, Ac 4	17	0.259	Cu 2, As 2, (Ci, Cs) 4	16	0.246	Cu 4, Ac 2
3	17	0.237	Cu 4	07	0.238	(Sc, Cu) 6, (Ac, As) 2	17	0.242	(Sc, Cu) 4, Ac 2
4	08	0.238	Cu 2, Cs 2	17	0.254	Cu 4, Ac 2	17	0.246	(Sc, Cu) 5, Ac 2
5	08	0.269	Ac 3	18	0.249	Sc 3, Ac 2	16	0.229	(Sc, Cu) 4, Ci 1
6	08	0.243	Sc 2, (Ac, As) 3	17	0.263	Cu 2, Ac 4	No observation		Bad weather
7	No observation		Bad weather	08	0.230	Ac 3, Cs 4	12	0.234	Cu 4, (Ci, Cs) 3
8	18	0.249	Cu 4	08	0.238	(Ci, Cs) 4	12	0.239	Cu 3, Ac 2, Ci 1
9	08	0.253	Cu 1, hazy	17	0.265	Cu 5, Cs 2	17	0.239	Cu 4, Ac 2
10	18	0.259	Cu 5, As 3	17	0.258	Cu 3, (Ci, Cs) 2	16	0.241	"
11	17	0.262	(St, Sc) 5	17	0.237	(Sc, Cu) 5	16	0.243	Cu 3
12	17	0.254	(Ac, As) 4, (Ci, Cs) 2	08	0.242	Sc 2, (Ac, As) 3, Cs 1	16	0.238	(Sc, Cu) 3, (Ci, Cs) 1
13	08	0.246	(Ci, Cs) 5	17	0.263	(Sc, Cu) 6, Ac 2	08	0.262	(Sc, Cu) 6, (Ac, As) 2
14	17	0.238	Cu 4, Ac 2	17	0.259	Cu 3, Ac 2	16	0.237	(Sc, Cu) 3, Ac 1, Ci 2
15	17	0.251	Cu 3, Ac 2	17	0.251	(Sc, Cu) 3, (Ac, As) 2	16	0.225	(Sc, Cu) 5, Ac 1
16	17	0.223	(Sc, Cu) 4, Ci 4	No observation		Bad weather	16	0.253	(Sc, Cu) 5
17	No observation		Bad weather	08	0.263	(St, Cu) 2	16	0.249	(Sc, Cu) 5, Ac 2
18	"	"	"	17	0.251	(Sc, Cu) 2, Ac 1, (Ci, Cs) 3	08	0.247	Ac 3, (Ci, Cs) 5
19	12	0.237	Cu T, (Ac, As) 3	17	0.259	Sc 3, Ac 2	08	0.237	(Ci, Cs) 2
20	No observation		Bad weather	17	0.250	Cu 3, As 2	16	0.259	(Sc, Cu) 4
21	18	0.263	Cu 2, Ac 5	17	0.235	Cu 3, Ac 2	16	0.235	Cu 4, Ac 2
22	17	0.241	(Sc, Cu) 2, (Ac, As) 3 (Cu, Cs) 2	08	0.247	Sc 6, Ac 1	08	0.247	Cu 1, Ac T
23	17	0.259	Ac 3, (Ci, Cs) 2	17	0.239	Cu 1, Ac 2	09	0.235	(Sc, Cu) 6, Ac 1
24	07	0.234	(Cu, St) 4, (Ci, Cs) 1	17	0.222	Cu 3, Ci T	16	0.246	Cu 3, (Ci, Cs) 2
25	08	0.246	(Sc, Cu) 5, Ac 3	08	0.225	(Ci, Cs) 6, hazy	16	0.249	"
26	No observation		Bad weather	17	0.250	Cu 1, (Ci, Cs) 2	16	0.263	(St, Cu) 3
27	"	"	"	17	0.229	Cu 3	17	0.242	(Sc, Cu) 5, As 2
28	17	0.235	(Sc, Cu) 5, Ci 1	16	0.230	(Sc, Cu) 2	16	0.253	Cu 4, Ac 2
29	17	0.226	(Sc, Cu) 4	17	0.243	(St, Cu) 5, (Ac, As) 2	16	0.245	Ac 2, (Ci, Cs) 3
30	17	0.227	(Sc, Cu) 5, Ci 1	08	0.234	(Ac, As) 6	16	0.241	(St, Cu) 3, Ci 1
31	08	0.246	Ci 1	16	0.249	Cu 4, Ac 2			

NOTE—The cloud amounts are in oktas

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	JULY 1959			AUGUST 1959			SEPTEMBER 1959		
	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	No observation		Overcast	09	0.269	Ac 2, Cs 4, Ci 1	No observation		Overcast
2	"		"	08	0.267	Ci 4	11	0.270	Cu 2, Ci 3
3	"		"	11	0.282	Cu 1, Ci 6	No observation		Overcast
4	"		"	No observation		Overcast	"		"
5	"		Overcast, rain	"		"	"		Overcast, rain
6	"		"	10	0.266	Ac 2, Ci 3	08	0.266	Sc 1, Ac 2, Ci 2
7	"		"	09	0.263	Ac 4	08	0.267	Cu 2, Ci 4
8	"		Overcast	08	0.258	Ac 2, Ci 1	08	0.262	Cu 1, Sc 1, Ci 1
9	"		Overcast, rain	No observation		Overcast	No observation		Cu 1, Ac 1, Ci 5
10	"		"	"		"	08	0.265	Cu 1, Ci 1
11	"		Overcast	"		Overcast, rain	No observation		Overcast
12	"		Sc 2, Ac 4, Ci 1	"		Overcast	"		"
13	"		Overcast	"		Overcast, rain	"		"
14	"		"	09	0.267	Sc 2, Ci 1	09	0.258	Sc 3
15	08	0.265	Cu 2	08	0.267	Cu 3, Sc 1, Ci 1	08	0.258	Sc 2, Cs 3
16	09	0.266	Cs 3, Ci 2	08	0.263	Sc 2, Cu 1, Ci 2	08	0.257	Sc 2, Cu 1
17	No observation		Overcast	No observation		Overcast	No observation		Overcast
18	"		Overcast, rain	"		"	"		"
19	"		Overcast	"		Sc 4, Ac 3	"		"
20	"		"	"		Overcast	07	0.252	Cu 1, Ci 3
21	10	0.273	Sc 1, Ac 3, Ci 2	"		"	08	0.257	Cu 1, Ci 1
22	No observation		Overcast	"		"	No observation		Cu 2, Sc 2, Ci 3
23	"		Overcast, drizzle	"		"	08	0.255	Cs 4
24	"		Overcast	"		"	08	0.254	Sc 1, Ac 1, Ci 1
25	"		Overcast, drizzle	"		"	No observation		Overcast
26	"		Overcast	"		"	08	0.258	Sc 1, Ac 1, Ci 3
27	09	0.265	Ac 1, Ci 4, Cs 1	10	0.263	Cu 1, Ci 4, Cs 1	No observation		Sc 7
28	10	0.269	Sc 2, Cu 1, Ci 2	08	0.262	Ac 2, Ci 1	"		Overcast
29	08	0.265	Cu 1, Sc 1, Ci 4	08	0.261	Ac 3	"		"
30	08	0.263	Ac 2	No observation		Overcast	"		"
31	09	0.266	Cs 4, Ci 3	"		"	"		"

NOTE—The cloud amounts are in oktas