ROYAL OBSERVATORY

ANNALS

Number 6

Photoheliographic Results 1962, 1963 and 1964

Prepared under the direction of the Astronomer Royal

HERSTMONCEUX: ROYAL GREENWICH OBSERVATORY

PRICE £2·20 NET

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JOINT PUBLICATIONS OF THE ROYAL GREENWICH AND CAPE OBSERVATORIES

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1971

NOTE

The Photoheliographic Results contained herein are in continuation of those published in *Royal Observatory Bulletin* No. 144

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PHOTOHELIOGRAPHIC RESULTS 1962

INTRODUCTION

The photographs from which these measures were made were taken at the Royal Greenwich Observatory, the Royal Observatory, Cape of Good Hope, and the Kodaikanal Observatory, Southern India.

The photographs of the Sun obtained at Herstmonceux were taken with the 4-inch photoheliograph, of which the original object-glass had been replaced in 1910 by a Grubb photographic objective. The equivalent focal length of the photoheliograph with its present enlarging system (supplied in 1926 by Ross, Ltd.) is 67½ feet, the diameter of the Sun's image at the secondary focus being approximately 7½ inches.

The photographs of the Sun obtained at the Cape Observatory were taken under the superintendence of Her Majesty's Astronomer at the Cape, Dr. R. H. Stoy, and those at Kodaikanal under the superintendence of the Director, Dr. M. K. Vainu Bappu. At the Cape Observatory the instrument employed was a 4-inch photoheliograph giving an image of the Sun about 7½ inches in diameter; at Kodaikanal a Cooke photo-visual objective of 6 inches aperture was used, the image of the Sun which was obtained being of about the same size.

Photographs of the Sun were available for measurement on 365 days in 1962, those finally selected for measurement being supplied by the different observatories as under:

Herstmonceux	227
Cape	134
Kodaikanal	4
Total	365

The names of the measurers of the photographs for the year 1962 were as follows:

P. S. Laurie	Miss D. M. Hobden
G. W. Rickett	Miss M. E. Winter

At the primary focus of the photoheliographs at Herstmonceux and the Cape two spider-wires are fixed by which the zero of position angles on the photographs can be determined. These wires are inclined at an angle of 45° to the celestial equator. In the Kodaikanal instrument there is one wire fixed parallel to the equator.

The precise zero of position angles for the photoheliographs has been determined by three different methods.

(i) *Zero Photographs.* Plates were exposed twice, with an interval of about 100 seconds between the two exposures, the instrument being firmly clamped. Two images of the Sun, overlapping each other by about a fifth part of the Sun's diameter, were thus produced upon the plates. The exposures were so made that the line joining the cusps passed approximately through the centre of the plates and the inclinations of the two spider-wires to this line were measured. A small correction for the inclination of the Sun's path has been applied. Two or three zero photographs were usually taken each month at Herstmonceux, the Cape and Kodaikanal.

(ii) *Transits.* At Herstmonceux and the Cape, transits of the Sun were taken visually, the times of contact of the first and second limbs of the Sun with the two wires being noted by an eye-and-ear method. The ratio of the time taken by the Sun to pass over the NE–SW wire to the time taken to pass over the SE–NW wire was used in order to find the angle made by the Sun's path with the bisectors of the wires. From this, again incorporating a correction to allow for the inclination of the Sun's path, the orientation of the wires with respect to the N–S line could be inferred. Transits were usually taken at Herstmonceux and the Cape on four or more days during each month.

(iii) *Supplementary Zero Photographs.* At Herstmonceux supplementary partial images of the Sun were occasionally recorded on otherwise normal photographs, a second exposure being made after clamping the instrument firmly for 130 seconds. The small portion of the Sun's limb visible at the western edge of the plate could be used, together with the main image which it does not intersect, to deduce the orientation of the wires in a way similar to that used for the zero photographs. Six to ten supplementary zero photographs were taken at Herstmonceux each month. The values for the zero of position angles deduced from them were given half weight in the adoption of zero corrections to be used in the reduction of photographs.

The measures of the photographs were made with a large position-micrometer that can be used for photographs of the Sun up to 12 inches in diameter. In this micrometer the photograph is held with its film-side uppermost on three pillars fixed on a circular plate, which can be turned through a small angle about a pivot in its circumference by means of a screw and antagonistic spring acting at the opposite extremity of the diameter. The pivot of this plate is mounted on the circumference of another circular plate which can be turned by a similar screw-action about a pivot in its circumference. This pivot, 90° distant from that of the upper plate, is mounted on a third circular plate, with a position-circle graduated in divisions of 30 minutes of arc, which may be rotated about its centre. By this means small movements in two directions at right angles to each other can be readily given and the photograph can be accurately centred with respect to the centre of rotation of the position-circle. When this has been done, a Ramsden eyepiece, having at its anterior focus a glass diaphragm ruled with cross-lines into squares with sides of one hundredth of an inch (for measurement of areas), is moved along a slide adjusted so that the centre of the eyepiece moves diametrically across the photograph, the diaphragm being nearly in contact with the photographic film, so that parallax is negligible. The distance of a spot or facula from the centre of the disk is read from a scale and vernier to 1/250th of an inch, corresponding to 0·001 of the Sun's radius for images 8 inches in diameter. The position angle is read from the large position-circle which rotates with the photographic plate. The photograph is illuminated by diffused light reflected from white paper placed at an angle of 45° below the photograph.

In the case of large or complex groups of spots, the chief components were measured individually; so also in the case of groups near to the east or west limbs of the Sun where the effects of foreshortening are appreciable. In other cases the position of the centre of a group was estimated by the measurer at the micrometer or derived during the computation.

When required, corrections have been applied to the measured distances and position angles to allow for differential refraction. The details of this correction were given in the *Introduction* to the *Greenwich Photo-Heliographic Results* for 1909. It is necessary to apply this correction to about twenty per cent of the photographs taken at Herstmonceux in the months October to March.

1. *Positions and Areas of Sunspots for each Day in the Year* 1962 (p. 10).

In this section the measured positions and areas of sunspots are given for each day. The positions of sunspots are referred firstly to a system of apparent polar co-ordinates on the Sun's disk and secondly to a system of heliographic co-ordinates. Notes on the sunspot groups are given at the end of this section (p. 36).

The calculations of heliographic longitude and latitude are made from formulae given by W. de la Rue, B. Stewart and B. Loewy, *Phil. Trans.*, 1869. The system of heliographic co-ordinates may be defined as follows. The inclination of the Sun's axis to the ecliptic is assumed to be 82° 45′, the longitude of the ascending node of the Sun's equator on the ecliptic for 1962·0 to be 75° 13′·8, and the period of the Sun's sidereal rotation to be 25·38 days. The meridian which passed through the ascending node on 1854 January 1, Greenwich mean noon, is taken as the zero meridian and longitudes increase from east to west. The mean synodic rotation period is 27·2753 days; synodic rotation periods are counted from 1853 November 9, in continuation of Carrington's series.

Let r be the measured distance of a spot from the centre of the Sun's apparent disk and χ the position angle of the spot from the Sun's axis, R the measured radius of the Sun on the photograph, S the tabular semi-diameter of the Sun in arc, and ρ, ρ' the angular distances of a spot from the centre of the apparent disk, as viewed from the Sun's centre and from the Earth respectively. ρ — the heliocentric angle — is obtained from the following equations:

$$\rho' = \frac{r}{R}S \qquad \sin(\rho + \rho') = \frac{r}{R}$$

If B_0 and ϕ are the heliographic latitudes and L_0 and λ the heliographic longitudes of the Earth and the spot respectively,

$$\sin\phi = \cos\rho \sin B_0 + \sin\rho \cos B_0 \cos\chi$$
$$\sin(L_0 - \lambda) = \sin\chi \sin\rho \sec\phi$$

χ is found from the position angle measured eastwards from the north point of the Sun's disk by subtracting P, the position angle of the north end of the Sun's axis also measured eastwards from the north point. The three quantities P, B_0 and L_0 for the time of the exposure of each photograph are derived from the *Ephemeris for Physical Observations of the Sun*, given on page 302 of the *Astronomical Ephemeris* for 1962.

2. *General Catalogue of Groups of Sunspots for* 1962 (p. 42)

This catalogue first contains particulars of every group of sunspots which lasted for two or more days during 1962. The group numbers are in continuation of those given in 1961 and previous years. The table includes an indication of those groups which may be considered to be members of 'recurrent series' of groups.

Spot groups seen on one day only are given in a separate table, where they receive a distinctive numeration.

Recurrent groups were selected upon the following plan, reference being made to the General Catalogue. If any spot when first seen was 60° or more to the east of the central meridian, the catalogue and, if necessary, the Daily Results also (Section 1), were searched some fifteen to sixteen days earlier to ascertain whether a spot group of similar heliographic longitude and latitude was then near the west limb of the Sun. Similarly, if any spot group when last seen was 60° or more to the west of the central meridian, a search was made fifteen to sixteen days later. When there appeared to be a case of probable continuity between groups in consecutive rotations of the Sun, the character of the groups, their areas and their longitude and latitude have been carefully compared before accepting them as a recurrent group.

3. *Total Areas, Mean Areas and Mean Heliographic Latitudes of Sunspots and Faculae in the Year* 1962 (p. 48).

This section contains total areas of sunspots and faculae (the latter separated into west and east hemispheres) for each day in the year, together with mean areas and mean heliographic latitudes of sunspots and faculae for each rotation of the Sun during 1962. Similar annual mean values are also given.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR 1962

The first line for each day gives the month numerically, the date and decimal of a day reckoned from midnight, the position angle of the Sun's axis from the north point and the heliographic longitude and latitude of the centre of the disk, all being computed for the time of the photograph.

Col. 1. Number of spot group in order of appearance and in continuation of the group numbers given in *Royal Observatory Bulletin* No. 144. Single figures (1 = leader, 2 = follower) beneath the number of a spot group indicate the principal and most stable components of that group. (The areas of such components are already included in the total area of the group.) Groups seen on one day only are distinguished by the number of the rotation during which they were observed and prefixed by a number in smaller type giving the order of their appearance.

Col. 2. Distance of spot group from Sun's centre in units of the Sun's radius.

Col. 3. Position angle of spot group measured from the north pole of the Sun's axis in the direction *N. E. S. W. N.*

Col. 4. Heliographic longitude of spot group derived from the measures.

Col. 5. Heliographic latitude of spot group similarly derived.

Col. 6. Area of umbrae corrected for foreshortening and expressed in millionths of the Sun's visible hemisphere.

Col. 7. Area of whole spots composing the group similarly expressed.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
01	1·286	+ 2·1	310·3	− 3·1		
20358	·977	266·9	28·0	− 3·7	30	169
20361	·848	295·5	4·4	+19·6	32	161
20364	·798	284·0	1·8	+ 9·2	3	30
01	2·466	+ 1·5	294·7	− 3·2		
20364	·948	283·7	4·7	+11·9	3	34
20361	·948	291·7	3·5	+19·3	31	158
20366	·958	72·5	223·3	+15·7	3	34
01	3·488	+ 1·0	281·3	− 3·3		
20361	·994	289·7	3·0	+19·1	9	138
20366	·890	70·6	220·9	+15·6	19	101
01	4·311	+ 0·6	270·4	− 3·4		
20366	·803	67·1	220·3	+16·0	11	91
01	5·278	+ 0·2	257·7	− 3·5		
011449	·456	114·1	232·5	−13·8	0	14
20366	·679	61·7	219·4	+16·0	9	44
01	6·300	− 0·3	244·2	− 3·6		
20366	·526	50·7	219·3	+16·1	4	26
01	7·288	− 0·8	231·2	− 3·8		
20366	·400	30·3	219·1	+16·5	3	19
01	8·288	− 1·3	218·1	− 3·9		
20366	·346	356·1	219·5	+16·2	1	12
01	9·279	·	·	·	0	0
01	10·471	− 2·4	189·3	− 4·1		
021449	·757	281·2	237·4	+ 5·7	0	17
01	11·580	·	·	·	0	0
01	12·467	− 3·3	163·0	− 4·3		
20367	·727	280·3	208·7	+ 4·4	1	7
01	13·424	− 3·8	150·4	− 4·4		
20367	·865	277·5	209·6	+ 4·2	0	13
20368	·972	74·9	75·8	+13·5	0	31
01	14·485	− 4·3	136·5	− 4·5		
20367	·952	276·2	207·9	+ 4·4	9	86
20369	·833	284·4	191·2	+ 9·3	2	29
20368	·917	72·2	72·3	+14·3	18	100
031449	·977	74·7	60·6	+13·9	0	9
01	15·480	− 4·7	123·4	− 4·6		
20367	·992	275·1	205·3	+ 4·5	15	146
20369	·941	282·3	192·1	+ 9·9	3	35
20368	·809	68·2	72·6	+14·5	7	69
01	16·295	− 5·1	112·6	− 4·7		
20369	·985	281·3	191·3	+10·2	65	300
20368	·676	62·6	74·5	+14·4	0	30
01	17·459	− 5·7	97·3	− 4·8		
20368	·519	53·6	72·0	+13·5	1	21
01	18·463	− 6·1	84·1	− 4·9		
20368	·363	27·6	74·2	+13·8	0	15
20370	·976	83·1	7·5	+ 5·6	17	311
1	·969	82·7	9·4	+ 5·8	12	155

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
01	19·494	− 6·6	70·5	− 5·0		
20368	·337	338·7	77·7	+13·3	0	4
20370	·903	80·8	7·0	+ 6·1	96	635
1	·877	80·4	10·3	+ 5·9	45	345
01	20·342	− 7·0	59·3	− 5·1		
20370	·802	78·4	7·3	+ 6·1	180	1071
1	·762	77·8	11·1	+ 5·9	105	545
01	21·312	− 7·4	46·6	− 5·2		
20370	·645	74·3	8·1	+ 6·0	221	1275
1	·591	72·9	12·1	+ 5·7	139	719
2	·712	75·6	2·8	+ 6·4	82	556
01	22·454	− 7·9	31·5	− 5·3		
20370	·432	64·0	8·6	+ 6·0	184	1248
1	·357	58·7	13·8	+ 5·6	109	674
2	·520	68·1	2·6	+ 6·5	75	574
20371	·639	50·0	0·3	+19·6	3	27
01	23·511	− 8·4	17·6	− 5·4		
20372	·737	292·2	61·7	+12·3	3	18
20370	·252	36·5	9·0	+ 6·3	163	1161
1	·205	14·4	14·7	+ 6·0	99	624
2	·334	51·8	2·4	+ 6·7	64	537
20371	·501	31·5	1·5	+20·0	18	112
20373	·977	78·6	301·4	+ 9·9	9	102
01	24·278	− 8·8	7·5	− 5·4		
20372	·851	288·0	63·2	+12·2	2	22
20370	·209	348·8	9·8	+ 6·3	145	1001
1	·237	328·0	14·8	+ 6·2	101	611
2	·229	24·2	2·1	+ 6·6	44	390
20371	·443	12·3	1·8	+20·1	25	184
20373	·958	76·9	295·9	+10·8	46	355

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
01	25·279	− 9·2	354·3	− 5·5		
20372	·955	284·8	65·0	+12·3	0	10
20370	·334	306·9	9·8	+ 6·2	144	1032
1	·401	299·2	14·9	+ 6·1	112	621
2	·246	326·6	2·1	+ 6·4	32	411
20371	·453	344·5	1·7	+20·3	27	164
20373	·875	74·6	295·4	+10·6	66	402
20374	·934	99·1	284·9	−10·5	0	3
01	26·277	− 9·6	341·2	− 5·6		
20370	·514	292·0	9·7	+ 6·1	139	976
1	·579	288·8	14·5	+ 6·1	106	605
2	·405	299·6	1·8	+ 6·3	33	371
20371	·548	323·4	1·5	+20·8	19	104
20373	·746	70·1	295·8	+10·8	56	385
20374	·822	97·2	285·7	− 9·1	3	18
01	27·289	−10·1	327·9	− 5·7		
20370	·693	284·8	10·1	+ 6·0	140	873
1	·743	283·3	14·4	+ 5·9	91	579
2	·586	289·0	1·6	+ 6·2	49	294
20371	·672	309·5	1·4	+20·5	10	84
20375	·143	134·5	321·9	−11·4	0	9
20373	·591	63·1	295·6	+10·7	54	398
20374	·678	99·3	285·2	−10·5	1	34
01	28·436	−10·6	312·8	− 5·8		
20370	·864	280·5	11·3	+ 6·0	129	826
1	·889	279·9	14·3	+ 6·0	97	630
20371	·820	300·4	1·8	+20·7	2	13
20375	·198	242·8	323·1	−10·9	4	10
20373	·412	47·3	294·9	+10·6	60	282
20374	·437	100·9	287·0	− 9·8	1	14
01	29·443	−11·0	299·5	− 5·9		
20370	·958	278·3	11·7	+ 6·2	90	809
1	·969	278·1	14·0	+ 6·3	73	653
20375	·438	256·4	325·1	−11·2	0	4
20373	·288	12·5	295·9	+10·4	77	695
20374	·265	108·2	284·8	−10·4	0	6

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
01	30·468	−11·4	286·0	− 5·9		
20370	·973	278·0	1·5	+ 6·3	8	70
011450	·390	236·0	305·8	−18·1	0	1
20373	·324	331·4	295·1	+10·6	73	718
20376	·965	82·7	212·3	+ 5·4	0	61
01	31·290	−11·8	275·2	− 6·0		
20373	·441	309·4	295·4	+10·6	108	827
20376	·885	80·2	214·2	+ 5·8	0	20
20377	·974	79·9	199·6	+ 8·4	9	109
02	1·431	−12·2	260·2	− 6·1		
20373	·619	294·9	294·8	+10·1	120	1108
20376	·769	76·7	211·5	+ 6·2	22	156
20377	·883	77·0	199·9	+ 8·4	18	73
02	2·468	−12·7	246·5	− 6·1		
20373	·775	288·6	294·6	+10·2	149	1087
20376	·592	70·9	212·4	+ 6·1	23	132
20377	·752	73·0	200·1	+ 8·5	11	46
02	3·300	−13·0	235·6	− 6·2		
20373	·875	285·4	294·3	+10·2	155	1194
20376	·442	62·1	212·6	+ 6·2	17	98
20377	·623	67·5	200·1	+ 8·7	17	56
02	4·410	−13·4	221·0	− 6·3		
20373	·961	282·6	293·2	+10·3	166	1003
20376	·246	31·2	213·6	+ 5·9	10	80
20377	·433	54·7	200·1	+ 8·6	8	31
02	5·455	−13·8	207·2	− 6·3		
20373	·997	281·0	291·1	+10·4	66	322
20376	·212	332·6	212·8	+ 4·5	0	37
20378	·240	31·2	200·0	+ 5·5	10	37
20377	·286	26·5	199·8	+ 8·5	9	24

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
02	6·292	−14·2	196·2	− 6·4		
021450	·823	261·9	251·9	−10·3	0	17
20376	·348	305·7	212·6	+ 5·5	4	34
20378	·226	336·6	201·3	+ 5·5	10	53
20377	·267	345·4	200·1	+ 8·6	6	20
02	7·460	−14·6	180·8	− 6·5		
20376	·563	291·6	212·4	+ 6·4	4	47
20378	·417	299·8	202·0	+ 5·9	1	17
20377	·418	307·4	200·3	+ 8·5	0	2
02	8·511	−15·0	167·0	− 6·5		
20376	·733	284·2	212·4	+ 5·8	16	93
20378	·622	288·1	203·3	+ 5·9	3	19
02	9·409	−15·3	155·1	− 6·6		
20376	·848	281·1	211·7	+ 5·8	29	138
02	10·335	−15·7	142·9	− 6·6		
20376	·940	279·1	211·7	+ 6·2	18	115
02	11·459	−16·1	128·1	− 6·7		
20376	·994	277·2	210·6	+ 6·3	30	150
031450	·874	283·3	187·2	+ 8·2	0	11
02	12·293	−16·4	117·2	− 6·7		
20379	·952	71·8	48·0	+15·0	0	6
02	13·392	−16·8	102·7	− 6·8		
20379	·854	67·6	48·0	+15·1	0	4

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
02	14·415	− 17·1	89·2	− 6·8		
01450	·497	282·3	118·1	+ 0·1	1	15
20379	·768	63·1	44·1	+15·5	0	3
20380	·956	75·1	18·6	+12·0	0	22
20381	·960	82·3	16·6	+ 5·4	38	298
02	15·432	− 17·5	75·8	6·9		
20380	·857	71·8	19·8	+11·7	0	8
20381	·871	79·5	16·7	+ 5·6	36	256
02	16·297	− 17·8	64·4	− 6·9		
20381	·761	76·3	16·7	+ 5·7	44	269
20380	·786	67·2	16·6	+13·1	0	3
02	17·459	− 18·1	49·1	− 6·9		
20380	·586	61·3	17·7	+10·4	0	7
20381	·570	69·5	16·8	+ 5·6	38	213
20382	·962	100·3	334·1	−11·8	0	13
02	18·523	− 18·5	35·1	− 7·0		
01450	·700	303·3	72·7	+17·1	0	3
20380	·428	40·9	18·5	+12·1	0	2
20381	·377	56·5	16·8	+ 5·3	39	188
20382	·857	99·9	335·7	−12·0	6	24
02	19·343	− 18·7	24·3	− 7·0		
20381	·251	31·5	16·8	+ 5·3	43	176
20382	·742	99·9	336·1	−12·1	0	16
20383	·994	99·7	299·8	−10·3	26	195
02	20·294	− 19·0	11·8	− 7·0		
20381	·229	336·9	16·9	+ 5·1	32	163
20382	·580	101·0	336·4	−12·1	0	7
20383	·952	98·7	298·9	−10·3	79	531
20384	·989	77·9	292·3	+10·7	90	678
02	21·293	− 19·3	358·6	− 7·1		
20381	·378	301·7	17·3	+ 4·7	42	197
20385	·445	95·7	332·1	− 8·9	6	30
20383	·851	98·1	299·8	−10·6	77	883
20384	·926	75·5	293·1	+10·5	99	518
02	22·409	− 19·7	343·9	− 7·1		
20381	·584	288·4	17·5	+ 4·7	31	124
20385	·202	99·4	332·4	− 8·7	0	16
20383	·709	98·0	298·5	−10·5	142	1026
20384	·806	71·1	293·3	+10·7	85	547
02	23·302	− 19·9	332·2	− 7·1		
20381	·733	283·2	17·7	+ 4·6	16	107
20385	·043	100·5	329·7	− 7·6	0	11
20383	·543	98·3	299·2	−10·4	114	1224
20384	·680	65·5	293·3	+10·8	104	592
20386	·927	69·5	267·9	+15·9	0	28
02	24·310	− 20·2	318·9	− 7·1		
20381	·868	279·5	17·9	+ 4·6	19	114
01451	·326	356·6	320·0	+11·8	0	4
20387	·370	20·8	311·2	+13·1	7	30
20388	·329	41·1	306·4	+ 7·3	0	12
20383	·320	102·8	300·5	−10·7	142	1218
20384	·517	55·1	293·5	+10·7	84	501
20386	·831	64·9	267·5	+16·3	4	36
02	25·303	− 20·5	305·8	− 7·2		
20381	·958	276·9	18·2	+ 4·5	18	65
20387	·372	337·3	314·3	+12·9	0	7
20388	·269	17·0	301·3	+ 7·7	0	11
20383	·104	130·6	301·3	−10·9	141	1158
20384	·371	33·9	293·7	+10·9	82	468
02	26·292	− 20·8	292·8	− 7·2		
20387	·471	313·8	313·1	+12·2	0	3
20383	·176	249·9	302·4	−10·4	141	982
20388	·253	320·8	302·0	+ 4·2	0	14
20384	·309	357·2	293·7	+10·7	92	431
20389	·970	80·6	218·3	+ 7·3	0	16

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
02	27·404	− 21·1	278·1	− 7·2		
20388	·498	293·1	305·4	+ 4·8	0	12
20383	·412	259·5	302·4	−10·7	156	1141
20384	·402	319·7	293·4	+10·8	82	433
20389	·882	77·4	218·1	+ 7·6	0	14
021451	·882	80·3	217·6	+ 5·1	0	7
20390	·967	80·6	204·4	+ 7·1	23	140
02	28·295	− 21·3	266·4	− 7·2		
20383	·593	261·2	302·9	−10·9	161	1156
20384	·533	303·3	293·2	+10·5	74	437
20389	·764	73·4	218·9	+ 7·7	0	13
20390	·892	78·1	205·1	+ 7·1	29	126
03	1·303	− 21·6	253·1	− 7·2		
20383	·773	261·8	304·1	−10·8	116	1062
20384	·699	293·7	293·7	+10·8	67	445
20389	·602	67·8	219·1	+ 7·2	6	28
20390	·751	74·0	206·6	+ 7·0	24	136
03	2·439	− 21·9	238·2	− 7·2		
20383	·910	261·0	304·2	−11·1	104	1016
20384	·847	287·3	293·3	+10·4	55	443
20391	·725	265·2	284·9	− 8·5	0	22
20389	·389	51·7	220·4	+ 7·0	0	19
20390	·573	66·2	206·4	+ 7·2	17	121
03	3·377	− 22·1	225·8	− 7·2		
20383	·979	259·6	305·1	−11·5	99	1116
20384	·939	284·1	293·5	+10·5	73	367
20391	·853	265·1	284·7	− 8·0	0	12
20389	·273	22·5	219·8	+ 7·4	0	10
20390	·381	51·4	208·5	+ 6·8	16	76
03	4·484	− 22·3	211·2	− 7·2		
20384	·995	281·1	293·6	+10·2	61	379
20383	·987	261·3	292·9	− 9·7	0	34
20389	·300	330·3	219·8	+ 7·9	0	5
20390	·250	12·1	208·2	+ 6·8	12	73
031451	·744	94·5	162·9	− 8·2	0	7
03	5·402	− 22·6	199·1	− 7·3		
20389	·452	298·9	222·5	+ 5·9	0	7
20390	·297	323·7	209·3	+ 6·6	9	50
20392	·538	49·0	174·5	+14·1	2	12
03	6·363	− 22·8	186·5	− 7·3		
20390	·405	306·9	205·4	+ 7·2	6	52
20392	·390	28·2	175·6	+12·9	5	63
03	7·364	− 23·0	173·3	− 7·3		
041451	·796	282·0	224·5	+ 5·0	0	18
20390	·632	290·0	209·8	+ 6·6	5	30
20392	·351	350·6	176·7	+12·9	2	40
03	8·510	− 23·2	158·2	− 7·2		
20390	·792	284·2	208·6	+ 6·6	0	15
20392	·464	318·4	176·6	+13·3	4	36
03	9·630	− 23·5	143·4	− 7·2		
20390	·920	281·1	208·7	+ 7·2	5	28
20392	·643	299·8	178·2	+12·6	2	22
03	10·303	− 23·6	134·6	− 7·2		
20392	·748	294·8	178·6	+13·1	2	8
03	11·291	·	·	·	0	0
03	12·304	·	·	·	0	0
03	13·367	− 24·2	94·2	− 7·2		
20393	·945	76·0	25·5	+10·7	27	377
03	14·357	− 24·3	81·1	− 7·2		
20393	·845	71·8	26·4	+11·2	29	214

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
03	15·358	- 24·5	67·9	-- 7·2		
20393	·708	66·3	26·7	+11·2	13	133
20394	·924	77·7	2·3	+ 8·5	0	14
03	16·356	- 24·7	54·8	- 7·1		
20393	·555	56·1	26·8	+11·7	8	79
20394	·814	74·8	2·5	+ 8·0	0	11
03	17·426	- 24·8	40·7	- 7·1		
20393	·380	35·1	27·9	+11·1	9	43
20394	·646	69·6	3·2	+ 7·3	0	6
20395	·963	77·6	328·2	+ 9·8	0	16
03	18·311	-- 24·9	29·0	-- 7·1		
20393	·317	3·6	27·9	+11·2	5	32
20395	·887	75·1	328·9	+ 9·7	2	10
20396	·981	99·1	309·4	- 10·3	15	132
03	19·374	-- 25·1	15·0	- 7·1		
20393	·372	326·0	27·2	+11·0	0	16
20397	·257	186·9	16·9	-21·8	1	11
20395	·768	70·5	327·8	+10·0	3	38
20396	·907	98·0	309·4	-10·1	18	84
20398	·923	95·5	307·2	- 7·8	3	14
20399	·991	79·4	294·1	+ 9·5	236	1841
1	·967	78·5	301·5	+ 9·2	35	233
03	20·356	- 25·2	2·1	- 7·0		
20393	·515	304·3	27·5	+10·5	0	11
20397	·365	228·2	18·9	-20·8	0	4
20395	·632	64·7	326·7	+ 9·9	2	38
20396	·785	98·3	310·0	-10·8	2	35
20398	·804	94·6	308·3	- 7·9	6	29
20400	·823	104·0	306·3	-15·5	0	8
20399	·941	77·1	293·8	+ 9·6	151	1447
1	·887	75·5	301·8	+ 9·4	31	133
2	·947	77·3	292·7	+ 9·6	112	1255

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
03	21·551	-- 25·4	346·3	- 7·0		
20401	·621	297·0	20·4	+10·5	0	11
20395	·400	43·4	330·2	+10·1	2	18
20396	·584	99·8	310·5	-11·3	2	21
20398	·613	94·4	308·3	- 8·2	0	8
20400	·638	104·9	306·9	-14·7	0	9
20399	·819	73·1	293·9	+ 9·6	200	1431
1	·732	70·4	302·2	+ 9·2	21	149
2	·841	73·6	291·6	+ 9·7	163	1027
20402	·991	72·8	266·9	+15·9	0	53
03	22·360	- 25·5	335·6	- 7·0		
20401	·761	291·0	21·8	+11·0	11	42
20395	·336	27·7	326·6	+10·3	3	27
20403	·390	110·3	313·5	14·2	0	5
20398	·456	94·5	308·4	- 8·2	0	7
20396	·501	101·7	305·7	-11·9	0	8
20399	·706	68·5	294·0	+ 9·8	168	1354
1	·603	64·3	302·4	+ 9·3	26	154
2	·734	69·3	291·6	+10·1	119	944
20402	·950	70·5	267·1	+16·0	6	67
03	23·517	- 25·6	320·4	- 6·9		
20401	·921	286·9	24·7	+12·6	0	16
20395	·311	337·6	327·3	+ 9·8	9	33
20404	·322	356·2	321·6	+11·7	1	23
20403	·171	137·2	313·5	-14·1	0	11
20396	·237	104·0	307·0	-10·0	0	9
011452	·271	123·2	306·8	-15·2	0	7
20399	·527	58·5	293·4	+ 9·8	194	1192
1	·413	48·0	302·4	+ 9·4	26	141
2	·558	60·4	291·0	+ 9·9	148	884
20402	·822	64·4	270·0	+16·4	0	16
03	24·343	- 25·7	309·5	- 6·9		
20395	·416	312·4	327·6	+ 9·7	5	28
20404	·376	331·4	320·1	+12·4	1	15
021452	·184	238·5	318·7	-12·3	0	10
031452	·045	242·7	311·8	- 8·1	0	6
20396	·084	148·9	307·0	-11·0	2	22
20399	·396	43·9	293·4	+ 9·9	165	1028
1	·304	22·9	302·6	+ 9·3	28	129
2	·424	47·7	291·0	+10·0	122	786

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1962		°	°	°		
03	25·334	− 25·8	296·4	− 6·9		
20395	·603	297·1	329·3	+10·1	4	25
20404	·511	309·2	320·3	+12·5	0	6
20396	·203	255·0	307·8	− 9·7	0	7
20399	·292	10·2	293·4	+ 9·7	141	1035
1	·302	338·7	302·8	+ 9·4	28	134
2	·302	17·4	291·2	+ 9·8	101	803
03	26·362	− 25·9	282·9	− 6·8		
20395	·761	289·8	329·4	+10·2	3	31
20396	·431	260·9	308·4	−10·1	1	9
20399	·342	326·5	293·8	+ 9·8	126	882
1	·438	309·0	303·0	+ 9·5	26	133
2	·322	333·1	291·4	+ 9·9	90	672
03	27·322	− 25·9	270·2	− 6·8		
20395	·893	285·5	331·1	+10·6	4	32
20396	·614	262·7	308·2	− 9·8	1	11
20399	·497	304·2	294·7	+10·0	124	891
1	·603	296·2	303·4	+ 9·8	21	135
2	·457	308·7	291·4	+10·2	79	578
03	28·313	− 26·0	257·1	− 6·7		
20404	·933	283·8	324·0	+10·3	0	10
20399	·661	293·0	295·1	+ 9·7	139	971
1	·753	289·0	303·2	+ 9·5	30	145
2	·618	296·0	291·3	+10·1	78	605
03	29·578	− 26·1	240·4	− 6·7		
20399	·842	286·3	295·3	+ 9·8	88	633
2	·807	288·0	291·6	+10·3	51	415
20405	·455	39·6	223·1	+14·1	0	4
20406	·396	108·9	217·9	−13·5	0	14
03	30·303	− 26·1	230·9	− 6·6		
20399	·925	283·6	296·5	+ 9·8	104	680
20405	·381	19·1	223·5	+14·4	0	17
20406	·234	119·7	218·9	−13·1	0	15
20407	·837	94·4	173·8	− 7·2	2	19

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1962		°	°	°		
03	31·307	− 26·2	217·6	− 6·6		
20399	·968	282·1	291·4	+ 9·9	65	290
20407	·663	93·0	176·0	− 6·9	3	29
04	1·351	− 26·2	203·9	− 6·5		
041452	·502	314·2	225·6	+14·4	2	14
20408	·271	321·7	213·5	+ 5·8	16	73
20407	·444	91·8	177·5	− 6·7	4	26
04	2·591	− 26·3	187·5	− 6·5		
20408	·492	294·4	214·1	+ 5·9	39	169
20407	·158	94·0	178·5	− 6·9	0	23
04	3·583	− 26·3	174·4	− 6·4		
20408	·670	286·1	214·6	+ 5·8	26	140
20407	·078	259·2	178·8	− 7·1	7	64
04	4·315	− 26·3	164·8	− 6·4		
20408	·787	282·6	215·1	+ 5·8	17	124
20407	·272	265·6	180·5	− 7·2	18	91
04	5·393	− 26·4	150·5	− 6·3		
20408	·926	278·6	217·3	+ 5·5	8	72
20407	·523	265·7	182·2	− 7·6	13	37
04	6·311	− 26·4	138·4	− 6·2		
20408	·994	277·2	221·1	+ 6·4	0	50
20407	·698	265·4	182·8	− 7·7	15	40
20409	·495	302·6	163·4	+ 9·8	0	4
04	7·314	− 26·4	125·2	− 6·2		
20407	·843	264·1	182·8	− 8·3	8	38
20409	·657	292·9	163·0	+ 9·9	10	65

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
04	8·309	-- 26·4	112·1	- 6·1		
20407	·941	263·2	182·6	- 8·5	3	22
20410	·854	267·0	170·8	- 5·8	0	7
20409	·792	288·4	161·7	+10·6	13	128
04	9·320	-- 26·3	98·7	- 6·0		
20410	·955	265·4	171·8	- 6·1	0	7
20409	·920	284·3	163·6	+10·6	16	204
04	10·321	- 26·3	85·5	- 6·0		
20409	·992	281·2	166·5	+10·2	17	157
04	11·411	- 26·3	71·1	- 5·9		
20411	·701	68·9	29·7	+10·2	0	8
20412	·990	96·7	349·0	- 7·5	37	283
04	12·326	- 26·3	59·0	- 5·8		
20411	·531	60·8	31·1	+ 9·8	11	66
20413	·940	61·5	354·2	+24·3	0	10
20412	·945	96·3	347·8	- 7·7	40	267
20414	·995	82·9	335·9	+ 6·4	33	260
04	13·320	- 26·2	45·9	- 5·7		
20411	·357	40·3	32·4	+10·1	26	150
20413	·863	56·2	353·7	+25·2	0	7
20412	·846	96·0	347·9	- 8·0	25	147
20414	·943	81·4	336·6	+ 6·1	27	229
20415	·986	80·6	326·7	+ 8·2	15	311
04	14·327	- 26·2	32·6	- 5·7		
20411	·283	1·9	32·1	+10·7	51	441
20412	·688	95·5	349·1	- 7·8	11	71
20414	·835	79·0	337·3	+ 6·0	28	205
20415	·920	78·1	327·2	+ 8·6	26	256

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
04	15·308	-- 26·1	19·7	- 5·6		
20411	·356	320·9	32·8	+10·5	65	424
20412	·504	96·2	349·4	- 7·8	10	68
20414	·688	75·1	337·9	+ 6·0	37	234
20415	·809	74·8	327·7	+ 8·8	28	248
20416	·967	79·3	305·9	+ 8·8	13	150
04	16·327	- 26·1	6·2	- 5·5		
20411	·505	302·1	31·9	+10·6	66	415
20412	·311	100·1	348·3	- 8·2	2	23
20414	·512	68·5	337·8	+ 6·0	34	219
20415	·648	69·9	328·4	+ 8·5	39	283
20416	·891	76·6	305·0	+ 9·3	22	111
04	17·304	- 26·0	353·3	- 5·4		
20411	·672	292·3	32·4	+10·5	51	427
20412	·111	116·9	347·6	- 8·1	1	23
20414	·329	53·9	337·9	+ 5·9	39	246
20415	·465	60·2	329·3	+ 8·3	43	310
20416	·772	72·8	305·1	+ 9·6	22	109
04	18·301	- 25·9	340·1	- 5·3		
20411	·817	286·8	32·6	+10·4	42	323
20414	·199	11·6	337·8	+ 5·9	67	230
20415	·293	38·1	329·7	+ 8·0	40	260
20416	·617	67·3	305·1	+ 9·4	12	71
04	19·343	- 25·8	326·4	- 5·3		
20411	·924	283·5	32·1	+10·3	48	228
20414	·276	314·6	337·7	+ 6·0	32	227
20415	·243	344·5	330·1	+ 8·2	70	364
20416	·436	53·4	305·6	+10·1	9	40
20417	·638	61·7	291·2	+13·3	0	5
04	20·383	- 25·7	312·6	- 5·2		
20411	·979	281·5	29·3	+10·1	17	141
20414	·457	294·2	337·3	+ 6·1	37	209
20415	·375	306·9	330·2	+ 8·0	73	324
011453	·079	217·9	315·4	- 8·7	0	7
20416	·297	26·4	305·0	+10·2	6	25
20417	·479	57·2	288·6	+10·3	0	9

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
04	21·544	− 25·6	297·3	− 5·1		
20418	·708	295·2	338·4	+13·7	0	26
20414	·670	284·9	337·8	+ 6·1	38	210
20415	·587	290·8	330·8	+ 7·8	46	342
20416	·298	335·2	304·6	+10·6	0	24
20417	·335	25·5	288·8	+12·5	0	34
20419	·206	128·6	287·9	−12·2	6	40
04	22·379	− 25·5	286·3	− 5·0		
20418	·852	290·3	341·6	+14·4	9	41
20414	·799	281·8	337·9	+ 6·3	34	199
20415	·748	286·2	332·7	+ 8·6	38	327
a1453	·534	262·0	318·5	− 8·4	0	8
20416	·413	308·1	305·4	+10·0	0	5
20417	·294	347·7	289·9	+11·6	0	20
20419	·139	195·3	288·4	−12·5	11	82
04	23·394	− 25·4	272·9	− 4·9		
20418	·949	286·6	342·2	+14·0	3	34
20414	·920	279·1	338·7	+ 6·4	28	158
20415	·891	282·7	334·2	+ 8·9	53	269
20416	·588	294·1	305·7	+ 9·7	0	2
20419	·300	245·2	288·9	−11·8	14	87
20417	·390	316·4	288·7	+11·6	0	14
04	24·451	− 25·3	258·9	− 4·8		
20414	·988	276·9	339·3	+ 6·0	6	45
20415	·982	280·1	336·9	+ 9·0	16	134
20419	·518	254·5	289·5	−11·9	6	52
20420	·999	80·9	172·6	+ 8·8	0	246
04	25·331	− 25·2	247·3	− 4·7		
20419	·654	256·0	287·7	−12·6	4	41
03 1453	·493	118·4	220·3	−17·7	0	8
20420	·966	80·0	173·5	+ 8·4	72	640
1	·966	80·0	173·5	+ 8·4	72	640
04	26·441	− 25·0	232·6	− 4·6		
20420	·882	78·0	172·2	+ 8·3	140	792
1	·873	78·0	173·2	+ 8·1	131	676
04	27·599	− 24·8	217·3	− 4·5		
20420	·731	74·5	172·2	+ 8·1	107	744
1	·716	74·2	173·4	+ 8·0	92	622
04	28·366	− 24·7	207·2	− 4·4		
20421	·397	51·2	188·9	+10·1	1	24
20420	·614	70·5	171·5	+ 8·2	128	767
1	·591	69·8	173·3	+ 8·1	105	576
04 1453	·795	74·1	156·5	+ 9·8	0	11
04	29·653	− 24·5	190·2	− 4·3		
20422	·736	281·0	236·4	+ 5·1	1	8
20421	·285	358·3	190·6	+12·2	0	1
20420	·376	55·6	172·0	+ 8·1	91	612
1	·362	54·3	172·9	+ 8·1	78	525
04	30·643	− 24·4	177·1	− 4·2		
20422	·843	278·7	233·7	+ 5·0	0	6
20420	·231	20·4	172·4	+ 8·2	80	513
1	·226	17·6	173·1	+ 8·2	70	455
20423	·110	112·8	171·3	− 6·6	0	5
20424	·973	68·6	103·1	+19·7	4	38
05	1·319	− 24·2	168·1	− 4·1		
20420	·233	341·0	172·5	+ 8·6	110	568
1	·236	339·0	173·0	+ 8·6	102	522
20423	·043	233·3	170·1	− 5·6	0	4
20425	·552	46·0	143·4	+18·7	0	18
20424	·928	65·8	103·7	+20·6	24	132
05	2·367	− 24·0	154·3	− 4·0		
20420	·385	305·0	172·8	+ 8·9	79	475
1	·388	304·5	173·1	+ 8·9	75	451
20425	·418	22·7	144·5	+18·6	1	13
20424	·816	61·6	104·6	+20·2	33	281
05	3·369	− 23·9	141·0	− 3·9		
20420	·562	292·8	172·5	+ 9·2	77	594

continued

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
05	3·369	*continued*				
1	·566	291·9	173·0	+ 8·8	66	450
20425	·389	345·9	146·8	+18·2	0	3
20424	·679	54·8	105·1	+19·8	37	201
05	4·323	− 23·7	128·4	− 3·8		
01453	·960	288·3	200·0	+16·3	12	74
20420	·723	286·5	172·9	+ 9·1	41	475
1	·723	286·5	172·9	+ 9·1	41	475
20424	·540	43·2	105·5	+19·6	17	137
05	5·359	− 23·5	114·7	− 3·7		
20420	·869	283·3	173·7	+ 9·6	46	447
1	·869	283·3	173·7	+ 9·6	46	447
20424	·429	21·2	105·3	+19·8	5	48
05	6·422	− 23·2	100·7	− 3·6		
20420	·962	281·0	173·7	+ 9·6	43	350
1	·962	281·0	173·7	+ 9·6	43	350
20424	·402	345·0	107·0	+19·2	1	12
20426	·360	134·8	85·2	−18·1	0	12
20427	·893	70·6	40·0	+15·4	2	26
05	7·535	− 23·0	86·0	− 3·5		
20420	·996	278·6	169·8	+ 8·2	0	119
20424	·519	317·2	107·8	+19·1	0	11
20427	·745	65·6	41·5	+15·4	12	44
05	8·438	− 22·8	74·0	− 3·4		
20424	·601	304·6	105·1	+17·0	0	6
20426	·326	217·0	85·9	−18·4	0	11
20427	·604	59·0	41·7	+15·2	9	38
20428	·994	98·9	350·3	− 9·2	39	307
05	9·384	− 22·6	61·5	− 3·3		
20426	·489	237·1	87·0	−18·2	3	33
20427	·449	45·8	42·1	+15·1	10	46
20428	·940	98·5	351·5	− 9·1	29	214
05	10·343	− 22·3	48·8	− 3·2		
20426	·659	245·5	87·8	−18·1	10	100
20427	·332	19·9	42·2	+15·0	6	28
01453	·424	46·5	30·5	+13·9	0	5
20428	·851	98·7	350·6	− 9·1	44	260
05	11·394	− 22·1	35·0	− 3·1		
20426	·824	249·5	89·2	−18·4	60	379
20427	·333	338·7	42·1	+14·9	4	14
20428	·701	99·8	350·8	− 9·0	45	225
05	12·333	− 21·9	22·5	− 3·0		
20426	·922	251·4	89·2	−18·2	67	462
20427	·451	313·7	42·2	+15·3	1	13
20428	·535	102·0	350·7	− 8·9	39	249
05	13·319	− 21·6	9·5	− 2·8		
20426	·989	251·8	91·2	−18·3	64	393
20427	·592	300·1	41·3	+14·8	3	20
20428	·329	108·8	351·2	− 8·8	29	253
05	14·323	− 21·3	356·2	− 2·7		
20427	·745	293·9	41·0	+15·6	0	7
20428	·134	140·1	351·3	− 8·6	24	160
05	15·328	− 21·1	342·9	− 2·6		
20428	·189	235·2	351·9	− 8·8	32	187
05	16·358	− 20·8	329·3	− 2·5		
20428	·392	252·7	351·5	− 9·0	27	154
20429	·993	84·6	246·8	+ 5·1	16	79
05	17·623	− 20·4	312·6	− 2·4		
20428	·635	258·4	351·5	− 9·1	28	218
20429	·913	83·2	247·2	+ 5·2	13	56
20430	·913	97·0	246·7	− 7·4	0	22

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
05	18·331	− 20·2	303·2	− 2·3		
20428	·752	259·6	351·6	− 9·3	38	149
20430	·830	97·4	247·4	− 7·4	0	10
20429	·838	82·2	246·9	+ 5·2	8	39
05	19·325	− 19·9	290·1	− 2·2		
20428	·880	260·5	351·4	− 9·4	28	148
20431	·281	343·1	294·8	+13·4	0	5
20429	·679	79·9	248·0	+ 5·2	5	22
20430	·707	98·3	245·4	− 7·4	1	8
05	20·348	− 19·6	276·5	− 2·0		
20428	·966	261·0	351·3	− 9·2	17	155
01454	·823	285·4	330·4	+11·4	0	4
20431	·384	315·4	292·6	+13·8	0	6
20429	·500	75·7	247·5	+ 5·3	3	17
20432	·981	73·6	199·1	+15·6	92	435
05	21·327	− 19·3	263·6	− 1·9		
20429	·294	65·6	248·1	+ 5·1	4	13
20432	·920	72·1	198·5	+15·6	55	435
20433	·995	98·7	179·5	− 8·9	42	270
05	22·308	− 19·0	250·6	− 1·8		
01454	·172	311·9	257·9	+ 4·8	0	7
20429	·127	18·0	248·4	+ 5·1	0	6
20432	·813	69·2	198·7	+15·6	56	469
20433	·966	98·0	175·8	− 8·1	96	909
1	·946	98·4	179·6	− 8·5	70	518
05	23·306	− 18·7	237·4	− 1·7		
20429	·231	301·1	248·8	+ 5·2	0	6
20432	·676	64·6	198·3	+15·5	46	317
20433	·874	98·5	176·8	− 8·2	148	888
1	·848	99·0	179·8	− 8·5	96	590
05	24·298	− 18·4	224·3	− 1·6		
20432	·513	56·0	198·3	+15·2	54	277
20433	·729	99·7	177·9	− 8·1	128	842
1	·704	100·5	180·0	− 8·5	103	643
05	25·339	− 18·0	210·5	− 1·5		
01454	·516	284·6	240·5	+ 6·2	0	4
20432	·356	35·6	198·1	+15·3	35	240
20433	·548	102·3	177·9	− 7·8	131	696
1	·516	103·8	180·2	− 8·3	98	514
05	26·324	− 17·7	197·5	− 1·3		
20432	·293	359·6	197·6	+15·6	30	196
20433	·339	109·9	178·8	− 7·8	101	616
1	·315	112·3	180·4	− 8·1	83	502
05	27·490	− 17·3	182·0	− 1·2		
20432	·390	316·5	198·1	+15·2	11	108
20433	·129	153·9	178·8	− 7·7	96	652
1	·126	160·3	179·6	− 8·0	87	587
05	28·379	− 17·0	170·3	− 1·1		
20432	·537	301·5	198·5	+15·3	20	95
20434	·284	324·2	180·0	+12·2	0	6
20433	·202	232·6	179·5	− 8·0	92	679
1	·208	233·7	180·0	− 8·1	88	642
05	29·321	− 16·6	157·8	− 1·0		
20432	·690	293·1	198·7	+14·9	30	147
20434	·443	299·7	180·8	+11·7	7	41
20433	·388	251·4	179·5	− 7·9	101	562
1	·391	251·6	179·7	− 8·0	94	516
05	30·301	− 16·3	144·8	− 0·9		
20432	·826	287·9	198·8	+14·2	55	334
20434	·632	289·6	182·1	+11·5	1	21
20433	·573	257·4	179·1	− 7·8	96	668
1	·575	257·4	179·2	− 7·9	96	659
05	31·325	− 15·9	131·3	− 0·7		
20432	·944	285·5	200·9	+14·3	50	477
20433	·748	260·1	179·2	− 7·9	102	683
1	·748	260·1	179·2	− 7·9	102	683
20435	·680	115·9	91·5	−17·8	0	10

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
06	1·320	− 15·5	118·1	− 0·6		
20432	·981	284·9	196·0	+14·5	22	92
20433	·873	261·8	178·5	− 7·4	77	574
1	·873	261·8	178·5	− 7·4	77	574
20435	·528	124·5	91·0	−17·9	0	11
06	2·430	− 15·1	103·4	− 0·5		
20433	·968	262·3	178·5	− 7·6	68	587
1	·968	262·3	178·5	− 7·6	68	587
20435	·365	145·9	91·1	−18·0	0	16
20436	·723	75·6	58·3	+10·0	9	33
06	3·340	− 14·8	91·4	− 0·4		
20433	·998	263·4	177·4	− 6·6	0	301
1	·998	263·4	177·4	− 6·6	0	301
20436	·536	73·7	60·2	+ 8·3	0	5
20437	·790	99·0	39·7	− 7·3	2	18
06	4·317	− 14·4	78·5	− 0·3		
20438	·351	213·6	90·1	−17·2	0	6
20437	·648	100·0	38·6	− 6·6	0	9
20439	·898	85·6	14·9	+ 3·8	0	8
06	5·369	− 14·0	64·5	− 0·1		
20438	·557	233·5	92·8	−19·4	0	8
20436	·176	32·7	59·1	+ 8·3	0	29
20440	·977	98·6	347·1	− 8·4	16	160
06	6·317	− 13·6	52·0	+ 0·0		
20436	·200	314·8	60·2	+ 8·1	7	41
20439	·598	82·2	15·7	+ 4·6	3	19
20440	·900	98·9	348·3	− 7·9	32	173
06	7·316	− 13·2	38·8	+ 0·1		
20436	·382	292·2	59·6	+ 8·4	10	46
20439	·360	78·1	18·2	+ 4·3	0	4
20440	·766	100·8	349·5	− 8·1	24	112
06	8·306	− 12·8	25·7	+ 0·2		
20436	·551	286·8	57·8	+ 9·3	1	18
20441	·188	299·4	35·1	+ 5·5	1	15
20440	·579	103·6	351·2	− 7·5	15	97
06	9·334	− 12·4	12·1	+ 0·4		
041454	·776	278·9	62·4	+ 7·1	0	9
20441	·410	279·7	35·8	+ 4·3	0	4
20440	·357	110·7	352·5	− 6·8	24	186
20442	·950	104·4	301·2	−13·4	0	52
06	10·353	− 12·0	358·6	+ 0·5		
20440	·195	134·4	350·6	− 7·3	21	96
20442	·845	106·0	302·3	−13·1	13	63
06	11·478	− 11·5	343·7	+ 0·6		
20440	·194	222·0	351·2	− 7·5	14	84
20442	·692	110·1	301·9	−13·1	1	24
20443	·970	84·3	268·0	+ 5·7	0	28
06	12·459	− 11·1	330·7	+ 0·7		
20440	·395	248·6	352·4	− 7·5	6	45
20442	·562	110·8	298·5	−10·8	7	44
20443	·895	83·7	267·5	+ 6·0	5	47
06	13·323	− 10·7	319·3	+ 0·8		
20440	·540	254·1	350·7	− 7·7	3	28
20442	·409	118·9	298·0	−10·5	12	61
20444	·675	75·4	277·9	+10·4	0	6
20443	·789	83·0	267·5	+ 6·0	0	19
06	14·320	− 10·3	306·1	+ 1·0		
20440	·726	258·8	351·8	− 7·3	3	18
20442	·242	148·3	298·7	−10·8	14	80
20444	·498	70·9	277·6	+10·2	8	39

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
06	15·525	− 9·8	290·1	+ 1·1		
20440	·864	259·5	349·1	− 8·5	0	7
20442	·258	217·1	299·1	−10·6	15	97
20445	·142	80·1	282·1	+ 2·5	0	8
20444	·275	53·4	277·2	+10·4	7	52
20446	·324	78·8	271·6	+ 4·6	0	7
20447	·432	126·5	269·2	−13·7	0	8
06	16·404	− 9·4	278·5	+ 1·2		
20442	·418	240·0	300·0	−10·8	9	62
20445	·095	291·5	283·5	+ 3·2	3	31
20444	·151	2·4	278·1	+ 9·8	6	28
20446	·151	63·6	270·7	+ 5·0	0	6
20447	·314	149·5	269·0	−14·5	0	9
20448	·960	74·4	205·2	+15·3	0	16
06	17·308	− 9·0	266·5	+ 1·3		
20442	·594	248·7	300·7	−11·2	4	33
011455	·489	294·4	293·6	+12·8	0	7
20445	·315	277·5	284·6	+ 3·6	8	35
20444	·265	305·4	279·1	+10·1	0	11
20447	·292	185·7	268·2	−15·4	9	37
20448	·888	73·6	204·8	+15·1	0	13
20449	·984	73·7	187·1	+16·2	19	158
06	18·338	− 8·6	252·9	+ 1·4		
20442	·791	253·8	303·6	−11·8	11	53
20445	·542	275·0	285·5	+ 3·9	1	15
20444	·448	289·3	278·2	+ 9·8	0	10
20447	·398	223·5	269·3	−15·2	6	40
20448	·763	71·0	204·7	+15·3	0	4
20449	·902	72·6	189·5	+16·3	2	63
20450	·959	99·8	180·0	− 9·0	0	12
06	19·321	− 8·2	239·9	+ 1·5		
20442	·907	256·3	303·8	−11·6	25	168
20444	·581	287·0	274·2	+11·0	0	18
20447	·549	239·4	269·0	−14·7	0	47
20449	·781	70·8	190·0	+15·8	17	114
20450	·874	100·8	179·8	− 8·6	5	18
06	20·347	− 7·7	226·3	+ 1·7		
20442	·984	257·6	305·1	−11·7	12	177
20444	·743	283·3	273·5	+11·0	2	40
20449	·594	65·3	192·3	+15·7	4	99
20450	·738	103·7	180·0	− 8·9	1	10
06	21·474	− 7·2	211·4	+ 1·8		
20444	·892	281·8	274·0	+11·3	0	14
021455	·790	279·9	263·1	+ 8·9	0	2
20449	·425	55·6	190·1	+15·5	16	92
20450	·563	108·9	178·9	− 9·0	2	11
06	22·525	− 6·7	197·4	+ 1·9		
031455	·971	255·7	272·5	−13·3	0	37
041455	·302	349·9	200·6	+19·2	0	3
20449	·267	23·0	191·2	+16·1	18	116
20450	·343	119·7	180·0	− 7·9	1	10
06	23·349	− 6·4	186·5	+ 2·0		
20449	·264	338·6	192·3	+16·2	25	148
20450	·237	139·7	177·7	− 8·3	0	13
06	24·368	− 5·9	173·0	+ 2·1		
20449	·404	308·4	192·2	+16·5	14	97
20451	·985	90·5	93·3	0·0	98	743
1	·980	90·9	94·9	− 0·5	78	472
06	25·315	− 5·5	160·5	+ 2·2		
051455	·932	275·4	229·1	+ 5·8	8	50
20449	·521	298·6	188·9	+16·4	4	31
20451	·921	91·3	93·7	− 0·2	106	622
1	·914	91·9	94·8	− 0·8	73	453
20452	·989	109·9	80·5	−19·3	7	53
06	26·317	− 5·0	147·3	+ 2·4		
061455	·897	282·4	210·6	+12·2	0	8
20451	·803	92·2	94·1	− 0·2	105	564
1	·791	92·8	95·3	− 0·8	72	404
20452	·926	112·4	82·2	−19·6	20	217

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
06	27·319	− 4·6	134·0	+ 2·5		
20451	·646	93·1	94·0	0·0	100	574
1	·627	94·2	95·4	− 0·7	70	389
20452	·820	116·4	82·9	−19·7	30	219
06	28·317	− 4·1	120·8	+ 2·6		
20451	·455	95·6	94·0	− 0·2	103	588
1	·433	97·5	95·5	− 0·9	65	386
20452	·680	123·5	83·8	−19·8	28	192
06	29·604	− 3·6	103·7	+ 2·7		
20451	·173	107·3	94·3	− 0·2	115	643
1	·159	111·3	95·2	− 0·6	93	479
20452	·501	140·8	84·1	−20·1	38	227
06	30·318	− 3·2	94·3	+ 2·8		
20451	·058	186·6	94·7	− 0·3	89	584
1	·060	199·9	95·5	− 0·4	72	448
20452	·423	157·2	84·3	−20·0	25	155
20453	·534	147·6	76·1	−24·1	1	27
20454	·832	101·8	39·2	− 8·2	0	16
07	1·370	− 2·7	80·4	+ 2·9		
20451	·265	258·6	95·3	− 0·1	89	470
1	·270	258·3	95·6	− 0·3	87	440
20452	·403	188·5	84·0	−20·3	25	120
20453	·469	171·2	75·9	−24·6	4	16
071455	·435	109·4	56·1	− 5·6	0	14
20454	·689	105·1	38·3	− 8·2	0	21
07	2·433	− 2·3	66·3	+ 3·0		
20451	·489	264·6	95·3	0·0	71	392
1	·496	264·3	95·8	− 0·2	70	357
20452	·489	215·2	83·7	−20·5	14	83
20453	·488	198·1	75·8	−24·5	2	21
07	3·344	− 1·9	54·2	+ 3·1		
20451	·652	266·7	94·7	+ 0·2	72	389
1	·664	266·4	95·6	− 0·1	65	332
20452	·595	227·8	82·3	−20·6	11	72
07	4·336	− 1·4	41·1	+ 3·2		
20451	·801	268·5	94·1	+ 0·7	84	470
1	·820	267·7	95·9	0·0	62	315
20452	·743	237·7	83·2	−20·9	5	30
07	5·527	− 0·9	25·3	+ 3·4		
20451	·935	269·6	94·4	+ 0·8	82	489
1	·943	268·9	95·6	+ 0·1	46	342
20452	·868	244·1	81·6	−20·4	0	29
07	6·657	− 0·3	10·4	+ 3·5		
20451	·996	270·3	94·9	+ 0·7	88	511
1	·997	269·9	95·5	+ 0·2	71	406
20455	·304	348·3	14·1	+20·7	0	8
20456	·982	81·1	291·2	+ 9·4	72	431
07	7·384	0·0	0·8	+ 3·6		
20455	·363	319·6	15·2	+19·4	0	13
20456	·938	81·6	290·9	+ 9·1	77	594
07	8·370	+ 0·4	347·7	+ 3·7		
011456	·753	107·5	300·9	−10·5	0	5
20456	·835	81·2	291·2	+ 9·4	71	353
07	9·318	+ 0·9	335·2	+ 3·8		
20456	·696	80·3	291·3	+ 9·4	67	295
07	10·362	+ 1·3	321·4	+ 3·9		
20456	·508	77·9	291·2	+ 9·5	47	302
07	11·331	+ 1·8	308·5	+ 4·0		
20456	·313	71·4	291·1	+ 9·5	51	324
021456	·798	74·3	256·1	+14·8	0	4

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
07	12·371	+ 2·2	294·8	+ 4·1		
20456	·116	33·9	291·0	+ 9·5	57	300
07	13·314	+ 2·7	282·3	+ 4·2		
20456	·173	306·8	290·3	+10·0	62	334
20457	·818	105·7	229·3	−10·3	0	22
07	14·434	+ 3·2	267·5	+ 4·3		
20458	·680	266·7	310·0	+ 0·9	0	3
20456	·408	284·6	291·0	+ 9·8	58	305
20457	·615	113·3	232·6	−10·6	0	7
20459	·946	80·0	196·2	+10·8	0	14
07	15·425	+ 3·6	254·4	+ 4·4		
20458	·840	267·6	311·2	+ 0·4	0	13
20456	·599	280·5	290·9	+ 9·8	52	296
20459	·840	80·4	197·3	+10·4	0	2
07	16·444	+ 4·1	240·9	+ 4·5		
20456	·769	278·7	291·1	+ 9·6	45	278
20460	·644	246·0	277·6	−11·5	0	1
20459	·747	78·0	192·8	+11·9	0	4
20461	·971	86·5	164·7	+ 4·4	0	14
07	17·320	+ 4·5	229·3	+ 4·6		
20456	·882	278·4	291·3	+ 9·5	51	311
20460	·786	251·2	278·5	−11·7	0	7
20459	·566	77·5	195·2	+10·8	0	1
20461	·896	87·8	165·7	+ 4·1	0	13
07	18·314	+ 4·9	216·1	+ 4·7		
20456	·967	278·5	291·6	+ 9·4	44	257
20460	·902	254·7	278·6	−11·6	0	8
03 1456	·353	31·1	204·8	+22·1	0	1
04 1456	·351	47·3	200·4	+18·2	0	1
20459	·355	71·8	196·1	+10·7	0	3
20461	·762	88·5	166·5	+ 4·1	0	4

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
07	19·336	+ 5·3	202·6	+ 4·7		
20461	·611	87·3	164·9	+ 5·4	0	7
07	20·324	+ 5·8	189·5	+ 4·8		
20461	·396	86·5	166·2	+ 5·8	3	13
07	21·381	+ 6·2	175·5	+ 4·9		
05 1456	·237	197·0	179·5	− 8·1	0	8
20461	·142	84·8	167·4	+ 5·6	0	3
20462	·970	86·2	99·6	+ 4·9	0	28
20463	·977	90·6	98·0	+ 0·5	16	97
07	22·366	+ 6·6	162·5	+ 5·0		
20462	·885	87·3	100·3	+ 4·8	0	22
20463	·903	91·8	98·2	+ 0·6	10	64
07	23·317	+ 7·1	149·9	+ 5·1		
20462	·749	87·3	101·4	+ 5·4	0	4
20463	·784	93·2	98·7	+ 0·7	11	85
07	24·317	+ 7·5	136·7	+ 5·2		
20463	·636	95·4	97·6	+ 0·6	4	49
07	25·416	+ 7·9	122·2	+ 5·3		
20463	·423	100·6	97·7	+ 0·4	3	23
07	26·329	+ 8·3	110·1	+ 5·4		
20463	·248	104·9	96·3	+ 1·6	0	11
07	27·450	+ 8·8	95·3	+ 5·4		
20463	·100	186·8	95·9	− 0·2	0	12

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
07	28·332	+ 9·2	83·6	+ 5·5		
20463	·250	248·8	97·0	+ 0·2	0	19
07	29·343	+ 9·6	70·2	+ 5·6		
20463	·437	261·8	95·7	+ 1·5	1	25
07	30·333	+ 10·0	57·1	+ 5·7		
20463	·646	264·8	97·0	+ 1·0	0	24
07	31·356	·	·	·	0	0
08	1·312	·	·	·	0	0
08	2·329	+ 11·2	17·5	+ 5·9		
061456	·722	84·0	331·2	+ 8·4	0	4
08	3·326	·	·	·	0	0
08	4·324	+ 12·0	351·1	+ 6·0		
20464	·322	243·2	7·8	− 2·6	4	16
08	5·365	+ 12·4	337·4	+ 6·1		
20464	·548	256·1	9·4	− 2·4	0	1
011457	·688	79·5	293·8	+11·6	0	3
08	6·325	+ 12·7	324·7	+ 6·2		
021457	·066	345·8	325·6	+ 9·8	0	1
20465	·161	80·8	315·5	+ 7·5	1	26
08	7·657	+ 13·2	307·0	+ 6·2		
20465	·176	276·4	317·2	+ 7·3	0	4
031457	·209	311·6	316·3	+14·1	0	6
08	8·319	+ 13·5	298·3	+ 6·3		
20465	·325	270·2	317·3	+ 6·0	1	11
041457	·198	306·4	307·7	+12·9	0	14
08	9·321	·	·	·	0	0
08	10·325	·	·	·	0	0
08	11·388	·	·	·	0	0
08	12·369	+ 15·0	244·8	+ 6·5		
20466	·251	88·6	230·2	+ 6·6	5	39
08	13·324	+ 15·3	232·1	+ 6·6		
20466	·005	223·0	232·3	+ 6·3	12	61
051457	·879	66·3	170·7	+23·9	0	9
20467	·991	88·5	149·7	+ 2·4	0	85
08	14·323	+ 15·6	218·9	+ 6·6		
20466	·225	267·2	231·9	+ 5·8	25	188
20467	·937	90·5	149·6	+ 1·9	68	274
08	15·338	+ 16·0	205·5	+ 6·7		
20466	·441	269·1	231·7	+ 5·6	60	380
20467	·841	92·3	148·5	+ 1·7	40	195
08	16·417	+ 16·4	191·2	+ 6·7		
20466	·655	270·6	232·2	+ 5·5	62	357
20467	·677	94·0	148·9	+ 2·2	41	209
08	17·317	+ 16·7	179·3	+ 6·8		
20466	·777	271·9	230·4	+ 5·8	52	239
20467	·520	97·8	148·4	+ 1·7	24	153
20468	·665	94·9	138·0	+ 1·8	0	18

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
08	18·323	+17·0	166·0	+ 6·8		
20466	·909	273·2	231·6	+ 5·7	52	326
20467	·331	106·4	147·6	+ 1·1	23	156
20468	·460	98·4	139·1	+ 2·2	1	31
08	19·340	+17·3	152·6	+ 6·8		
20466	·975	274·3	230·0	+ 5·7	15	127
20469	·061	221·9	155·0	+ 4·2	0	9
20467	·132	140·2	147·8	+ 1·0	21	93
20468	·230	109·2	140·1	+ 2·4	17	110
20470	·947	81·7	80·7	+10·1	0	6
08	20·346	+17·7	139·3	+ 6·9		
20469	·293	264·0	156·2	+ 4·8	0	12
20467	·176	235·1	147·6	+ 1·0	20	91
20468	·090	171·4	138·6	+ 1·9	18	115
20470	·837	81·1	82·1	+11·2	0	6
08	21·312	+18·0	126·5	+ 6·9		
20469	·479	267·5	155·1	+ 4·9	0	8
20467	·376	255·9	147·8	+ 1·2	20	79
20468	·232	248·6	138·9	+ 1·9	13	96
08	22·353	+18·3	112·8	+ 7·0		
20467	·581	262·5	147·8	+ 1·4	20	64
20468	·442	261·8	138·6	+ 2·6	10	68
08	23·350	+18·6	99·6	+ 7·0		
20471	·886	251·0	158·8	−13·2	0	2
20467	·751	265·4	147·9	+ 1·2	16	69
20468	·623	264·9	137·8	+ 2·3	4	39
08	24·395	+18·9	85·8	+ 7·0		
20471	·980	255·3	161·9	−12·8	27	200
20467	·886	267·8	147·9	+ 1·3	19	63
20468	·795	268·0	138·3	+ 2·7	2	17
08	25·458	+19·2	71·8	+ 7·1		
20467	·969	270·2	147·3	+ 2·0	10	42
08	26·321	+19·5	60·4	+ 7·1		
20472	·994	82·4	336·2	+ 8·4	8	38
08	27·318	+19·7	47·2	+ 7·1		
20472	·944	84·3	336·0	+ 7·7	0	11
20473	·988	97·0	327·1	− 5·7	0	29
08	28·333	+20·0	33·8	+ 7·1		
20473	·933	98·9	326·2	− 5·5	0	22
08	29·360	+20·3	20·2	+ 7·2		
20473	·847	100·9	323·8	− 5·3	2	30
08	30·339	+20·6	7·3	+ 7·2		
20473	·707	105·1	324·2	− 5·4	6	32
20474	·716	83·6	321·3	+ 9·6	4	18
08	31·315	+20·8	354·4	+ 7·2		
20473	·519	114·5	326·1	− 6·1	0	5
20474	·531	82·8	322·2	+ 9·9	8	42
09	1·327	+21·1	341·0	+ 7·2		
20473	·300	138·7	329·6	− 5·8	7	64
20474	·317	80·9	322·6	+ 9·7	23	180
20475	·996	85·1	256·0	+ 5·5	57	222
09	2·349	+21·3	327·5	+ 7·2		
20473	·230	187·1	329·1	− 5·8	30	143
20474	·095	59·2	322·9	+ 9·9	34	200
20475	·951	86·5	255·4	+ 5·6	52	360

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
09	3·365	+ 21·6	314·1	+ 7·2		
20473	·338	227·4	328·5	− 6·1	32	138
20474	·170	286·1	323·6	+ 9·8	57	409
20476	·605	73·0	277·2	+16·0	0	4
20475	·856	88·0	255·1	+ 5·4	63	404
20477	·989	104·0	234·7	−12·6	30	189
09	4·554	+ 21·9	298·4	+ 7·2		
20473	·551	246·8	328·9	− 6·2	13	69
20474	·423	277·5	323·4	+ 9·7	106	847
20476	·346	69·0	279·1	+13·9	0	3
20475	·682	89·5	255·3	+ 5·6	59	399
20477	·924	107·1	233·8	−12·6	51	268
20478	·962	98·7	225·7	− 6·3	9	41
09	5·322	+ 22·1	288·3	+ 7·2		
20473	·682	252·1	328·8	− 6·5	6	40
20474	·581	276·7	323·9	+ 9·8	111	955
20476	·194	52·2	279·2	+14·0	1	6
20475	·545	90·9	255·2	+ 5·6	70	365
20477	·843	110·4	234·3	−12·8	38	233
20478	·906	101·4	224·9	− 7·1	2	26
09	6·540	+ 22·3	272·2	+ 7·3		
20473	·843	256·7	327·7	− 7·1	0	10
20474	·777	276·9	323·5	+ 9·9	119	706
20476	·180	311·7	280·1	+14·0	0	4
20475	·295	93·7	255·1	+ 5·9	70	421
20477	·671	118·5	235·1	−12·8	25	212
20478	·736	106·4	227·0	− 6·9	0	7
09	7·327	+ 22·5	261·8	+ 7·3		
20474	·881	277·4	324·0	+10·0	109	708
20475	·116	102·3	255·2	+ 5·8	75	405
20477	·557	126·8	234·6	−12·9	36	206
20478	·608	111·8	227·3	− 7·0	0	6
09	8·467	+ 22·8	246·7	+ 7·3		
20474	·974	279·0	324·3	+10·4	79	556
20475	·147	262·0	255·1	+ 6·0	72	449
20477	·408	147·2	233·7	−12·8	46	305
20479	·988	66·6	163·4	+24·1	6	64
09	9·339	+ 23·0	235·2	+ 7·3		
20474	·995	279·7	320·2	+10·3	32	190
20475	·342	267·9	255·2	+ 6·1	72	390
20477	·344	176·0	233·8	−12·6	45	247
20479	·949	67·1	162·5	+23·9	11	67
09	10·310	+ 23·2	222·4	+ 7·3		
20475	·542	270·1	255·3	+ 6·1	85	380
20477	·392	208·8	233·5	−12·8	37	228
20479	·875	66·5	161·2	+24·1	0	21
09	11·335	+ 23·4	208·8	+ 7·2		
20475	·725	271·9	255·4	+ 6·3	73	316
20477	·541	232·1	234·7	−12·7	22	165
20479	·758	64·5	160·6	+24·0	0	5
20480	·966	69·9	132·3	+21·3	8	92
09	12·530	+ 23·6	193·1	+ 7·2		
20475	·887	273·6	255·8	+ 6·5	41	335
20477	·729	244·6	235·4	−12·8	26	149
20481	·291	166·1	189·0	− 9·1	3	12
20479	·552	57·3	162·7	+23·6	1	19
20480	·850	69·4	134·7	+21·3	48	252
09	13·314	+ 23·7	182·7	+ 7·2		
20475	·954	274·9	255·7	+ 6·8	64	415
20477	·837	249·3	235·9	−12·9	21	159
20481	·314	208·2	191·3	− 8·8	1	8
20480	·751	67·6	134·7	+21·5	75	400
20482	·908	78·3	116·8	+13·6	0	8
09	14·320	+ 23·9	169·4	+ 7·2		
20475	·998	276·6	256·3	+ 7·0	37	308
20477	·937	253·2	236·2	−13·0	23	132
20481	·461	234·5	191·6	− 8·8	1	4
20480	·593	63·3	134·9	+21·4	94	379
20482	·784	78·5	117·5	+13·5	4	22

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
09	15·375	+ 24·1	155·5	+ 7·2		
20477	·990	255·9	235·4	−12·8	25	119
011458	·154	242·0	163·3	+ 3·0	0	15
20480	·426	53·2	134·1	+21·4	87	522
20482	·611	78·7	117·8	+12·6	0	7
09	16·297	+ 24·3	143·3	+ 7·2		
20480	·308	33·6	132·8	+21·8	91	566
20482	·443	75·7	117·3	+12·7	0	5
09	17·326	+ 24·4	129·7	+ 7·2		
20480	·268	344·7	134·1	+22·0	66	366
09	18·318	+ 24·6	116·7	+ 7·1		
20480	·387	313·3	134·2	+22·1	39	377
09	19·313	+ 24·7	103·5	+ 7·1		
20480	·556	299·6	134·8	+22·0	53	318
09	20·359	+ 24·9	89·7	+ 7·1		
20480	·731	293·2	135·8	+21·7	41	149
20483	·436	159·3	80·5	−17·0	0	5
021458	·928	79·3	20·9	+12·5	0	7
09	21·388	+ 25·0	76·1	+ 7·1		
20480	·862	291·0	135·8	+21·6	28	148
20483	·406	190·4	80·5	−16·3	5	40
20484	·957	84·8	2·5	+ 7·0	0	12
09	22·331	+ 25·2	63·7	+ 7·1		
20480	·945	290·5	135·6	+21·6	27	122
20483	·498	217·1	81·9	−16·6	3	18
20484	·867	85·1	3·2	+ 7·8	28	121
20485	·991	81·0	340·4	+ 9·9	0	26
09	23·366	+ 25·3	50·0	+ 7·0		
20486	·398	301·1	71·0	+18·4	0	9
20484	·708	85·7	4·8	+ 8·0	39	172
20485	·957	80·8	336·2	+10·9	0	21
09	24·067	+ 25·4	40·8	+ 7·0		
20486	·535	293·7	71·7	+18·4	1	9
20484	·577	84·4	5·4	+ 8·9	47	178
20485	·846	80·6	342·6	+11·6	0	20
09	25·344	+ 25·5	23·9	+ 7·0		
20486	·724	288·5	70·0	+18·1	4	35
20487	·304	298·9	39·8	+15·1	23	93
20484	·296	81·8	6·7	+ 9·0	31	204
20485	·688	81·3	340·2	+11·0	0	14
09	26·342	+ 25·6	10·7	+ 6·9		
20487	·516	287·6	41·2	+14·9	6	42
20484	·057	42·5	8·6	+ 9·2	28	129
20485	·503	77·8	340·7	+12·1	0	7
09	27·320	+ 25·7	357·8	+ 6·9		
20487	·702	283·7	42·4	+14·5	5	29
20484	·178	282·4	7·9	+ 9·0	31	214
20485	·320	74·3	339·6	+11·5	0	24
011459	·493	77·0	328·5	+12·4	1	6
09	28·424	+ 25·8	343·3	+ 6·8		
20487	·854	282·9	42·3	+14·5	0	7
20484	·439	275·7	9·3	+ 8·6	23	152
20488	·996	83·1	258·0	+ 7·5	36	271
1	·996	83·1	258·0	+ 7·5	36	271
09	29·312	+ 25·9	331·6	+ 6·8		
20484	·613	275·4	9·5	+ 8·6	24	158
20485	·113	305·8	336·9	+10·5	0	6
20488	·961	84·5	257·2	+ 7·1	36	182
1	·961	84·5	257·2	+ 7·1	36	182

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
09	30·678	+26·0	313·5	+ 6·7		
20485	·443	282·4	339·6	+11·5	0	10
20489	·513	125·4	288·4	−11·1	1	17
20488	·826	85·0	257·6	+ 7·9	43	376
1	·832	86·2	257·0	+ 6·9	24	195
20484	·849	275·6	11·9	+ 8·3	8	70
10	1·325	+26·0	305·0	+ 6·7		
20489	·408	137·4	288·7	−11·0	6	45
20488	·733	85·1	257·7	+ 8·1	53	369
1	·742	86·7	257·0	+ 7·0	30	190
20484	·913	276·2	11·3	+ 8·4	16	98
10	2·334	+26·1	291·7	+ 6·7		
20489	·304	162·9	286·5	−10·2	0	1
20488	·564	85·6	257·2	+ 7·9	41	315
1	·574	87·6	256·6	+ 6·8	23	161
20484	·984	277·2	12·0	+ 8·3	0	30
10	3·306	+26·2	278·9	+ 6·6		
20488	·369	86·0	257·2	+ 7·6	35	253
1	·383	88·4	256·3	+ 6·7	23	142
10	4·329	+26·2	265·4	+ 6·5		
20488	·149	85·8	256·8	+ 7·1	25	175
1	·159	89·4	256·2	+ 6·6	15	132
10	5·316	+26·2	252·3	+ 6·5		
20488	·078	273·6	256·7	+ 6·7	27	174
1	·066	267·3	256·1	+ 6·3	27	143
10	6·361	+26·3	238·5	+ 6·4		
20488	·296	269·9	255·8	+ 6·1	31	121
1	·296	269·9	255·8	+ 6·1	31	121
20490	·133	305·7	244·8	+10·8	1	19
20491	·948	89·0	167·2	+ 3·0	0	20

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1962		°	°	°		
10	7·374	+26·3	225·2	+ 6·4		
20488	·509	271·2	255·8	+ 6·1	16	156
1	·509	271·2	255·8	+ 6·1	16	156
20490	·359	284·6	245·8	+11·1	0	23
20491	·829	91·3	169·3	+ 2·5	2	12
20492	·925	87·8	157·5	+ 4·5	0	26
10	8·339	+26·3	212·4	+ 6·3		
20488	·682	272·1	255·5	+ 6·0	20	113
1	·682	272·1	255·5	+ 6·0	20	113
20491	·678	92·9	170·0	+ 2·7	12	52
20492	·807	89·1	158·6	+ 4·5	3	43
20493	·996	103·0	129·5	−12·2	47	264
10	9·342	+26·3	199·2	+ 6·3		
20488	·832	272·5	255·6	+ 5·5	18	86
1	·832	272·5	255·6	+ 5·5	18	86
20491	·482	96·3	170·7	+ 2·5	13	85
20492	·640	90·5	159·5	+ 4·5	3	38
20493	·957	105·4	128·4	−12·6	59	434
10	10·341	+26·4	186·0	+ 6·2		
20488	·937	273·5	255·8	+ 5·4	18	102
1	·937	273·5	255·8	+ 5·4	18	102
20491	·246	105·9	172·4	+ 2·2	21	122
20492	·433	91·9	160·4	+ 4·8	27	147
20493	·860	108·6	129·6	−12·4	49	405
10	11·588	+26·4	169·6	+ 6·1		
20491	·091	211·9	172·3	+ 1·8	25	146
20492	·168	95·6	160·0	+ 5·1	27	154
20493	·708	114·9	128·6	−12·7	54	367
10	12·457	+26·3	158·1	+ 6·1		
20491	·247	252·1	171·6	+ 1·6	24	127
20492	·064	250·3	161·4	+ 4·9	19	109
20493	·578	122·9	128·4	−13·0	28	328
20494	·984	88·3	78·4	+ 2·8	0	19

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
10	13·453	+26·3	145·0	+ 6·0		
20491	·466	261·8	172·3	+ 1·5	20	115
20492	·299	266·5	162·3	+ 4·7	8	57
20493	·423	139·5	128·7	−12·9	37	340
20494	·917	90·5	78·7	+ 2·0	22	131
10	14·390	+26·3	132·6	+ 5·9		
20491	·645	265·5	172·5	+ 1·6	14	110
20492	·470	266·9	160·6	+ 3·8	0	32
20493	·325	169·7	129·2	−12·6	42	305
20494	·804	91·5	79·3	+ 2·4	39	187
10	15·368	+26·3	119·7	+ 5·8		
20491	·796	268·3	172·3	+ 2·2	22	104
20493	·359	207·0	129·3	−12·7	21	174
20494	·638	92·4	80·2	+ 3·0	40	188
10	16·532	+26·2	104·4	+ 5·8		
20491	·931	270·1	172·9	+ 2·2	15	99
20493	·527	235·2	130·5	−12·2	25	155
20494	·417	94·9	79·9	+ 3·2	26	200
10	17·420	+26·2	92·7	+ 5·7		
20491	·988	271·4	173·5	+ 2·3	19	99
20493	·683	244·8	131·7	−12·4	15	80
20494	·236	102·0	79·4	+ 2·7	16	145
10	18·416	+26·1	79·5	+ 5·6		
20493	·827	250·6	132·4	−12·4	14	66
20494	·053	195·2	80·3	+ 2·8	11	77
20495	·995	80·1	354·8	+10·4	0	75
10	19·316	+26·1	67·6	+ 5·5		
20493	·926	253·7	133·1	−12·7	3	51
20494	·260	265·7	82·6	+ 4·2	0	9
20495	·956	80·7	354·2	+10·5	22	126
10	20·303	+26·0	54·6	+ 5·5		
20494	·439	265·8	80·5	+ 3·1	0	16
021459	·393	254·0	76·7	− 1·2	0	17
20495	·865	81·2	354·5	+10·3	15	115
20496	·975	80·6	337·0	+10·4	24	157
10	21·354	+25·9	40·8	+ 5·4		
20495	·712	80·9	355·4	+10·2	17	106
20496	·887	81·6	338·0	+ 9·9	61	347
10	22·383	+25·8	27·2	+ 5·3		
20497	·847	242·3	79·9	−20·0	0	12
20498	·506	259·1	56·9	− 0·9	1	17
20495	·530	79·0	355·4	+10·3	17	75
20496	·759	81·3	337·8	+10·0	56	311
10	23·607	+25·7	11·0	+ 5·2		
20497	·961	248·9	81·9	−18·6	0	12
20498	·745	264·5	58·7	− 0·6	0	8
031459	·612	265·4	48·5	+ 1·3	0	7
20499	·582	238·0	41·4	−13·5	0	1
041459	·124	270·2	18·2	+ 5·2	0	2
051459	·110	41·1	6·9	+ 9·9	0	7
20495	·285	71·3	355·2	+10·2	8	27
20496	·557	79·3	337·4	+10·2	53	325
10	24·644	+25·6	357·4	+ 5·1		
20499	·757	247·6	43·2	−13·2	23	88
011460	·331	257·6	16·1	+ 0·7	0	12
20495	·097	22·6	355·2	+10·2	5	14
20496	·344	73·4	337·9	+10·4	40	220
10	25·563	+25·5	345·3	+ 5·0		
20499	·874	251·2	43·5	−13·6	14	90
20495	·193	298·1	355·2	+10·1	0	5
021460	·129	342·3	347·5	+12·0	0	14
20496	·137	51·0	339·1	+ 9·9	35	215

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
10	26·304	+ 25·4	335·5	+ 4·9		
20499	·935	253·8	42·5	−13·1	15	95
20496	·109	324·6	339·1	+10·0	30	173
20500	·947	74·3	263·9	+16·4	0	23
10	27·346	+ 25·3	321·7	+ 4·8		
20499	·993	256·3	43·2	−12·9	16	115
20496	·312	288·8	339·1	+10·4	32	212
20500	·847	73·2	264·1	+16·8	7	58
10	28·381	+ 25·2	308·1	+ 4·7		
20496	·527	281·4	339·6	+10·0	37	191
20500	·710	71·5	263·7	+16·4	3	44
10	29·390	+ 25·0	294·8	+ 4·6		
20496	·706	279·1	339·6	+ 9·7	26	176
10	30·382	+ 24·9	281·7	+ 4·5		
20496	·849	278·6	339·9	+ 9·7	48	161
10	31·387	+ 24·7	268·4	+ 4·4		
20496	·945	278·4	339·5	+ 9·4	21	129
20501	·226	84·7	255·5	+ 5·5	4	19
11	1·336	+ 24·6	255·9	+ 4·3		
20496	·993	277·3	339·3	+ 7·8	0	44
20502	·329	178·0	255·3	−14·8	0	20
20501	·035	77·2	254·0	+ 4·8	0	11
11	2·386	+ 24·4	242·1	+ 4·2		
20502	·392	212·3	254·6	−15·0	2	28
11	3·294	+ 24·2	230·1	+ 4·1		
20502	·519	230·9	254·7	−15·2	10	54
11	4·474	+ 24·0	214·6	+ 4·0		
20502	·714	243·7	256·0	−15·3	3	45
11	5·111	+ 23·9	206·2	+ 4·0		
20502	·815	247·8	257·5	−15·3	0	17
11	6·292	+ 23·7	190·6	+ 3·8		
20503	·989	104·6	110·7	−13·7	61	432
11	7·447	+ 23·4	175·4	+ 3·7		
ω1460	·843	81·6	117·9	+ 9·1	0	2
20503	·918	107·1	110·8	−14·1	71	403
11	8·355	+ 23·2	163·4	+ 3·6		
20503	·821	110·2	110·9	−14·3	78	426
11	9·248	+ 23·0	151·6	+ 3·5		
20503	·696	114·6	111·1	−14·1	83	365
11	10·304	+ 22·8	137·7	+ 3·4		
20503	·528	123·3	110·8	−13·8	70	383
11	11·294	+ 22·5	124·6	+ 3·3		
20503	·378	141·8	110·8	−14·0	79	359

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
11	12·564	+ 22·2	107·9	+ 3·1		
20503	·302	189·4	110·8	−14·2	87	372
20504	·277	19·2	102·4	+18·2	3	19
20505	·874	77·6	47·2	+12·4	13	89
20506	·914	106·7	43·7	−13·7	0	42
11	13·404	+ 22·0	96·8	+ 3·0		
20503	·376	218·7	110·8	−14·1	74	343
20504	·303	338·4	103·6	+19·3	25	141
20506	·786	111·5	47·9	−14·6	0	17
20505	·768	75·5	47·2	+13·0	8	77
11	14·292	+ 21·8	85·1	+ 2·9		
20503	·510	235·0	110·6	−14·3	86	319
20504	·408	313·1	103·4	+18·9	50	195
20505	·623	73·3	47·6	+12·6	10	63
20506	·666	117·2	47·4	−15·3	1	20
11	15·410	+ 21·5	70·4	+ 2·8		
20503	·688	245·9	110·6	−14·1	60	361
20504	·585	299·8	102·8	+19·2	28	143
20505	·410	63·4	48·4	+13·1	12	76
20506	·488	131·3	48·1	−16·0	1	20
11	16·292	+ 21·2	58·8	+ 2·7		
20503	·812	250·5	110·7	−14·1	65	316
20504	·716	294·4	102·2	+19·1	16	82
20506	·334	155·0	50·4	−14·8	10	79
20505	·251	46·5	48·1	+12·5	28	148
11	17·292	+ 20·9	45·6	+ 2·6		
20503	·920	253·5	110·7	−14·1	74	339
20504	·832	292·0	100·4	+19·6	5	53
20506	·318	191·4	49·3	−15·4	3	53
20505	·177	349·7	47·4	+12·5	43	273

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
11	18·293	+ 20·6	32·4	+ 2·4		
20503	·982	255·3	110·4	−14·0	65	333
20504	·935	290·1	100·9	+19·6	0	56
20505	·338	303·1	49·2	+12·9	28	218
20506	·421	219·3	48·5	−16·5	6	74
11	19·068	+ 20·4	22·2	+ 2·4		
20505	·495	293·9	49·8	+13·6	30	161
20506	·525	232·9	47·9	−16·2	15	85
11	20·354	+ 20·0	5·2	+ 2·2		
20505	·732	286·6	51·2	+13·6	22	158
20506	·723	245·0	48·1	−16·0	4	55
11	21·452	+ 19·7	350·7	+ 2·1		
20505	·875	284·2	51·2	+13·4	27	121
20506	·884	250·9	50·7	−15·7	0	18
11	22·436	+ 19·3	337·8	+ 2·0		
20505	·956	283·1	50·4	+13·0	12	96
20506	·933	252·7	45·0	−15·4	0	10
11	23·290	·	·	·	0	0
11	24·304	+ 18·7	313·1	+ 1·7		
20507	·315	289·5	330·5	+ 7·6	4	16
11	25·331	+ 18·4	299·6	+ 1·6		
20507	·522	282·0	330·5	+ 7·6	9	48
20508	·985	89·4	219·9	+ 0·8	47	192
11	26·324	+ 18·0	286·5	+ 1·5		
20507	·677	280·3	328·6	+ 8·0	0	36
20508	·914	89·6	220·6	+ 1·0	23	144

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1962		°	°	°		
11	27·295	+17·7	273·7	+ 1·3		
20507	·843	277·1	330·9	+ 6·7	0	6
20508	·799	89·7	220·9	+ 1·0	31	168
11	28·294	+17·3	260·6	+ 1·2		
20508	·641	90·0	220·9	+ 0·9	25	153
11	29·295	+16·9	247·4	+ 1·1		
20508	·443	89·7	221·2	+ 1·1	30	157
11	30·435	+16·5	232·3	+ 0·9		
20508	·187	89·9	221·6	+ 0·9	45	193
20509	·634	64·5	195·9	+16·5	0	7
12	1·445	+16·1	219·0	+ 0·8		
20508	·048	270·9	221·8	+ 0·9	26	162
20509	·457	54·5	196·4	+16·1	38	141
12	2·444	+15·7	205·9	+ 0·7		
20508	·276	271·1	221·8	+ 1·0	17	136
20509	·306	28·7	197·1	+16·2	31	213
12	3·455	+15·3	192·5	+ 0·6		
20508	·493	270·7	222·0	+ 0·8	26	164
20509	·288	341·3	198·0	+16·3	29	205
20510	·991	102·7	111·0	−12·5	39	339
12	4·459	+14·9	179·3	+ 0·4		
20508	·681	270·9	222·1	+ 0·9	29	127
20509	·419	311·9	198·2	+16·6	22	104
20511	·461	47·7	158·4	+18·4	2	30
20510	·933	103·9	111·3	−12·7	51	260
12	5·464	+14·5	166·1	+ 0·3		
20508	·834	270·7	222·3	+ 0·7	32	127
20509	·580	298·4	198·0	+16·2	9	68
20511	·333	21·9	158·6	+18·2	5	46
20510	·828	105·8	111·5	−12·8	54	252
12	6·470	+14·1	152·8	+ 0·2		
20508	·939	270·7	222·5	+ 0·7	29	104
20509	·745	292·3	198·6	+16·5	7	21
20511	·327	339·0	159·9	+17·9	2	21
01 1461	·635	73·1	114·8	+10·7	1	6
20510	·689	109·1	111·1	−12·9	41	213
20512	·975	107·1	76·6	−16·6	0	9
12	7·473	+13·7	139·6	+ 0·1		
20508	·992	270·5	221·9	+ 0·5	0	34
20509	·867	288·9	198·1	+16·3	0	11
20511	·482	308·9	162·7	+17·6	0	16
20510	·516	115·5	111·2	−12·7	28	197
20512	·892	108·3	77·9	−16·2	0	8
12	8·283	+13·4	128·9	− 0·1		
20509	·957	287·5	201·0	+16·7	0	14
20510	·367	126·9	111·5	−12·7	20	169
20512	·789	109·7	78·7	−15·5	0	11
12	9·428	+12·9	113·8	− 0·2		
20510	·224	168·5	111·2	−12·8	21	89
20512	·625	116·5	78·4	−16·2	0	22
12	10·481	+12·4	100·0	− 0·3		
20510	·292	220·5	111·1	−13·0	17	69
20512	·418	126·9	79·8	−14·8	0	9
12	11·281	+12·1	89·4	− 0·4		
20510	·415	237·3	110·3	−13·2	7	37

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1962		°	°	°		
12	12·484	+11·5	73·6	− 0·6		
20510	·639	249·3	111·4	−13·5	3	13
20513	·775	95·5	23·1	− 4·5	4	26
12	13·485	+11·1	60·4	− 0·7		
20510	·802	253·9	112·5	−13·3	0	7
20513	·596	96·2	24·1	− 4·1	1	15
12	14·495	+10·6	47·1	− 0·9		
20510	·901	253·4	110·3	−15·3	0	8
α1461	·253	191·4	50·0	−15·1	2	15
20514	·245	151·2	40·1	−13·1	1	11
12	15·281	+10·3	36·7	− 1·0		
20514	·208	201·5	41·2	−12·0	3	21
12	16·427	·	·	·	0	0
12	17·491	+ 9·3	7·6	− 1·2		
20515	·711	250·2	51·2	−14·7	29	109
12	18·491	+ 8·8	354·4	− 1·4		
20515	·846	253·2	51·1	−14·9	10	82
20516	·194	26·4	349·4	+ 8·6	18	108
α1462	·408	116·6	332·7	−11·7	0	18
12	19·508	+ 8·4	341·0	− 1·5		
20515	·928	255·8	48·6	−13·8	9	35
20516	·241	316·2	350·6	+ 8·5	22	135
12	20·279	+ 8·0	330·9	− 1·6		
20516	·396	297·9	351·5	+ 9·2	26	198
α1462	·167	15·6	328·3	+ 7·7	0	13
12	21·453	+ 7·4	315·4	− 1·7		
20516	·621	287·0	352·2	+ 9·0	64	332
α1462	·359	245·2	334·7	−10·3	1	15
12	22·393	+ 7·0	303·0	− 1·9		
20516	·784	283·2	353·5	+ 9·1	32	236
12	23·398	+ 6·5	289·8	− 2·0		
20516	·919	279·7	355·7	+ 8·1	42	190
20517	·951	80·3	218·6	+ 8·6	3	24
12	24·284	+ 6·1	278·1	− 2·1		
20516	·981	279·1	356·1	+ 8·5	16	199
20518	·777	282·0	328·0	+ 7·9	0	31
20517	·848	79·9	221·0	+ 7·4	0	39
12	25·260	+ 5·6	265·3	− 2·2		
20518	·903	280·4	328·9	+ 8·4	0	35
20517	·696	77·3	222·2	+ 7·2	0	19
12	26·317	+ 5·1	251·3	− 2·3		
20518	·985	279·6	330·5	+ 9·0	0	17
12	27·401	·	·	·	0	0
12	28·280	·	·	·	0	0
12	29·310	·	·	·	0	0
12	30·303	·	·	·	0	0
12	31·280	+ 2·7	186·0	− 2·9		
20519	·966	85·4	111·4	+ 3·7	0	8

NOTES ON SUNSPOT GROUPS 1962

Group 20366.	Jan.	2 – 8	A small spot with preceding companions on January 3 and 4.
Group 20367.	Jan.	12 – 15	One or two small spots, growing as they pass round the limb.
Group 20368.	Jan.	13 – 19	Return of Group 20360. A bi-polar group consisting of two spots which both break up to form small clusters on January 16. A leading small spot alone remains on January 19.
Group 20369.	Jan.	14 – 16	A tiny spot when first seen near the west limb. The whole group is developing rapidly as it passes from view.
Group 20370.	Jan.	18 – 30	Several small spots which develop rapidly into a large bi-polar group, consisting of two large composite spots with maximum area on January 21. The leader becomes nearly regular in outline by January 26 and retains its identity to the west limb. The follower disintegrates after January 26 and has declined to a few small spots at the limb.
Group 20371.	Jan.	22 – 28	One or two small spots developing into a cluster which dies out before reaching the west limb.
Group 20372.	Jan.	23 – 25	One or two tiny spots.
Group 20373.	Jan.	23 – Feb. 5	Three spots, each with numerous companions, forming an extended stream. On January 29 an increase of activity takes place, the rear components forming a large composite spot by February 2. The leading part of the group dies out before reaching the west limb.
Group 20374.	Jan.	25 – 29	A single tiny spot on January 25, 26 and 29; a cluster on the other days.
Group 20375.	Jan.	27 – 29	A few scattered tiny spots, of which only one remains on January 29.
Group 20376.	Jan.	30 – Feb. 11	A few faint spots developing into a scattered cluster by February 1. There is a revival of activity on February 8 and the group assumes stream formation as it passes from view.
Group 20377.	Jan.	31 – Feb. 7	A small declining spot.
Group 20378.	Feb.	5 – 8	A small stream which appears near the central meridian and dies out before reaching the west limb.
Group 20379.	Feb.	12 – 14	A single spot on February 12 and 13; one or two tiny spots on February 14.
Group 20380.	Feb.	14 – 18	One or two tiny variable spots.
Group 20381.	Feb.	14 – 25	A pair of small regular spots separated in latitude by 2°.
Group 20382.	Feb.	17 – 20	A tiny spot.
Group 20383.	Feb.	19 – Mar. 4	A large complicated stream, with numerous components, reaching maximum area on February 23. The principal leading components of the group form a large composite mass by February 24.
Group 20384.	Feb.	20 – Mar. 4	Return of Group 20373. A regular spot with variable companions until February 25. The umbra becomes elongated between February 26 and 29, but from March 2 the spot resumes a regular outline.

Group 20385.	Feb. 21 – 23	A pair of small spots on February 21 and 22; a cluster on February 23.
Group 20386.	Feb. 23 – 24	A single spot on February 23; numerous small spots on February 24.
Group 20387.	Feb. 24 – 26	A pair of spots on February 24; a single spot on the other days.
Group 20388.	Feb. 24 – 27	A few tiny scattered spots.
Group 20389.	Feb. 26 – Mar. 5	A single small spot until March 1, after which there is a small cluster. A single small spot alone remains on March 5.
Group 20390.	Feb. 27 – Mar. 9	A small bi-polar group, of which the leader alone remains by March 5. There is a brief appearance of rear companions on March 6.
Group 20391.	Mar. 2 – 3	One or two tiny spots.
Group 20392.	Mar. 5 – 10	A small stream of scattered spots, of which only one remains on March 10.
Group 20393.	Mar. 13 – 20	A composite spot, breaking up into a scattered cluster by March 16, and dying out before reaching the limb.
Group 20394.	Mar. 15 – 17	A single tiny spot.
Group 20395.	Mar. 17 – 27	A single tiny spot until March 18. From March 19 several other tiny spots appear intermittently to form a small variable stream.
Group 20396.	Mar. 18 – 27	Return of Group 20383. Several tiny spots, of which only one is seen on March 20, 26 and 27.
Group 20397.	Mar. 19 – 20	One or two tiny spots.
Group 20398.	Mar. 19 – 22	One or two tiny spots.
Group 20399.	Mar. 19 – 31	Return of Group 20384. A third appearance. An extended stream, of which the follower, a large complex spot, is the principal component. The leading portion of the group consists of scattered spots led by a small regular spot. The whole group begins to break up after March 28.
Group 20400.	Mar. 20 – 21	Tiny scattered spots.
Group 20401.	Mar. 21 – 23	A single tiny spot on March 21 and 23; a pair on March 22.
Group 20402.	Mar. 21 – 23	One or two tiny spots.
Group 20403.	Mar. 22 – 23	Tiny scattered spots.
Group 20404.	Mar. 23 – 28	One or two tiny spots, not seen on March 26 or 27.
Group 20405.	Mar. 29 – 30	One or two tiny spots.
Group 20406.	Mar. 29 – 30	A pair of tiny spots.
Group 20407.	Mar. 30 – Apr. 8	One or two tiny spots developing into a stream by April 1. The leader, a small regular spot, alone remains from April 5.
Group 20408.	Apr. 1 – 6	A small bi-polar stream which appears just past the central meridian; the leader alone remains at the west limb.
Group 20409.	Apr. 6 – 10	A single tiny spot developing into a stream of scattered spots.
Group 20410.	Apr. 8 – 9	A tiny spot.
Group 20411.	Apr. 11 – 20	One or two tiny spots developing into a bi-polar stream by April 15. The rear component becomes regular in outline on April 18, while the leading part disintegrates as the group approaches the limb.

Group 20412.	Apr. 11 – 17	A regular spot, with variable following companions; the whole dies out before reaching the central meridian.
Group 20413.	Apr. 12 – 13	One or two tiny spots.
Group 20414.	Apr. 12 – 24	A single spot becoming regular in outline by April 17, after which it begins to break up.
Group 20415.	Apr. 13 – 24	A cluster of numerous spots, of which the central part coalesces to form a single spot by April 19. The whole group begins to break up after April 22.
Group 20416.	Apr. 15 – 23	Two or three close spots which break up and die out before reaching the west limb.
Group 20417.	Apr. 19 – 23	A few tiny scattered spots.
Group 20418.	Apr. 21 – 23	A pair of small spots, of which only one remains on April 22.
Group 20419.	Apr. 21 – 25	A short-lived scattered stream.
Group 20420.	Apr. 24 – May 7	A moderate-sized regular spot with variable following companions until May 4; after this the leader begins to break up as it passes round the limb.
Group 20421.	Apr. 28 – 29	Several tiny spots on April 28; a single spot on April 29.
Group 20422.	Apr. 29 – 30	A tiny spot.
Group 20423.	Apr. 30 – May 1	One or two tiny spots.
Group 20424.	Apr. 30 – May 8	One or two tiny spots developing into a small stream by May 2. On May 4 it begins to break up and die out.
Group 20425.	May 1 – 3	Two or three tiny spots in stream formation.
Group 20426.	May 6 – 13	A few tiny scattered spots on May 6; nothing is seen on May 7. On May 8 other spots appear to form a stream led by a regular spot.
Group 20427.	May 6 – 14	A small spot on all days except May 13, when there is a pair.
Group 20428.	May 8 – 20	A diminishing regular spot with variable companions between May 13 and 17.
Group 20429.	May 16 – 23	A single spot which dies out just past the central meridian.
Group 20430.	May 17 – 19	One or two tiny spots, of which only one remains on May 19.
Group 20431.	May 19 – 20	A tiny spot.
Group 20432.	May 20 – June 1	A compact variable cluster, decreasing in area until May 28, after which there is a renewal of activity.
Group 20433.	May 21 – June 3	A moderate-sized stream led by a composite spot which is the most stable component throughout and alone remains on June 2.
Group 20434.	May 28 – 30	A small stream.
Group 20435.	May 31 – June 2	One or two tiny spots.
Group 20436.	June 2 – 8	A small stream of scattered spots, not seen on June 4.
Group 20437.	June 3 – 4	One or two tiny spots.
Group 20438.	June 4 – 5	Tiny scattered spots.
Group 20439.	June 4 – 7	Tiny variable spots, not seen on June 5.
Group 20440.	June 5 – 15	Return of Group 20428. A few small spots developing into an extended stream by June 8; on June 9 other small spots appear in the leading part of the group which then begins to break up and die out.

Group 20441.	June 8 – 9	A tiny spot.
Group 20442.	June 9 – 20	A pair of small spots, developing into an extended stream the leading part of which coalesces to form a single spot after June 18.
Group 20443.	June 11 – 13	A small short-lived stream.
Group 20444.	June 13 – 21	Tiny scattered spots of which only two remain on June 20.
Group 20445.	June 15 – 18	A bi-polar group.
Group 20446.	June 15 – 16	A tiny spot.
Group 20447.	June 15 – 19	Tiny spots developing into a bi-polar stream on June 17.
Group 20448.	June 16 – 18	A tiny spot.
Group 20449.	June 17 – 25	A small stream, of which the leading part coalesces into a composite spot by June 23 and dies out after June 24.
Group 20450.	June 18 – 23	Return of Group 20433. A scattered stream.
Group 20451.	June 24 – July 6	A bi-polar group led by a regular spot which retains its identity throughout. The following spot breaks up on June 29 to form scattered followers.
Group 20452.	June 25 – July 5	A regular spot with distant tiny companions until July 2. The whole group then disintegrates.
Group 20453.	June 30 – July 2	A small spot.
Group 20454.	June 30 – July 1	One or two small spots.
Group 20455.	July 6 – 7	One or two tiny spots.
Group 20456.	July 6 – 18	A regular spot with variable following companions until July 14. On July 15 the principal spot begins to break up and die out.
Group 20457.	July 13 – 14	A pair of tiny spots on July 13; a single tiny spot on July 14.
Group 20458.	July 14 – 15	A tiny spot.
Group 20459.	July 14 – 18	One or two tiny variable spots.
Group 20460.	July 16 – 18	A tiny spot.
Group 20461.	July 16 – 21	A tiny spot.
Group 20462.	July 21 – 23	One or two tiny spots.
Group 20463.	July 21 – 30	Return of Group 20451. A small variable group on the equator.
Group 20464.	Aug. 4 – 5	A small spot.
Group 20465.	Aug. 6 – 8	One or two tiny variable spots.
Group 20466.	Aug. 12 – 19	A few small spots growing rapidly into a complex stream with maximum area on August 15. On August 16 the rear part coalesces into a single spot, which becomes the principal component.
Group 20467.	Aug. 13 – 25	A stream of small spots, of which the following components develop into a regular spot by August 18. This alone remains from August 19.
Group 20468.	Aug. 17 – 24	A scattered cluster assuming stream formation on August 22 and dying out before reaching the limb.
Group 20469.	Aug. 19 – 21	One or two tiny spots forming near the central meridian.
Group 20470.	Aug. 19 – 20	One or two tiny spots.

Group 20471.	Aug. 23 – 24	A group of several spots developing rapidly near the west limb.
Group 20472.	Aug. 26 – 27	A small spot.
Group 20473.	Aug. 27 – Sept. 6	One or two tiny spots until August 31, when there is an increase in activity, and the group develops into a stream by September 3. On September 4 the group breaks up and dies out before reaching the limb.
Group 20474.	Aug. 30 – Sept. 9	A growing stream of several components until September 3, when the whole group assumes bi-polar formation. From September 5 it consists of two moderate-sized composite spots.
Group 20475.	Sept. 1 – 14	A stable regular spot.
Group 20476.	Sept. 3 – 6	A single spot.
Group 20477.	Sept. 3 – 15	A variable stream, led by a regular spot which alone survives on September 13.
Group 20478.	Sept. 4 – 7	One or two tiny variable spots.
Group 20479.	Sept. 8 – 12	One or two tiny spots.
Group 20480.	Sept. 11 – 22	A few spots developing into a moderate-sized stream by September 15, after which the group breaks up. The leader alone remains from September 20.
Group 20481.	Sept. 12 – 14	Tiny scattered spots on September 12; a single spot on the other days.
Group 20482.	Sept. 13 – 16	Tiny scattered spots, of which only a single spot remains on September 15.
Group 20483.	Sept. 20 – 22	One or two tiny spots.
Group 20484.	Sept. 21 – Oct. 2	A stream led by a regular spot from September 25; the regular spot alone remains on September 30.
Group 20485.	Sept. 22 – 30	A cluster of tiny spots, not seen on September 28.
Group 20486.	Sept. 23 – 25	A single tiny spot on September 23; a cluster on the other days.
Group 20487.	Sept. 25 – 28	A small stream which appears just past the central meridian; the leader alone remains on September 27.
Group 20488.	Sept. 28 – Oct. 10	Return of Group 20475. A regular spot until September 30 when several small spots appear to the north to form a stream by October 2. These companions die out, leaving the regular spot only by October 6.
Group 20489.	Sept. 30 – Oct. 2	Scattered tiny spots, of which one alone remains on October 2.
Group 20490.	Oct. 6 – 7	A few tiny spots.
Group 20491.	Oct. 6 – 17	A small spot developing into a scattered stream by October 9. The leader alone remains on October 14.
Group 20492.	Oct. 7 – 14	A few tiny spots developing into a scattered stream, which dies out before reaching the west limb.
Group 20493.	Oct. 8 – 19	A compact cluster of variable spots; two alone remain on October 17.
Group 20494.	Oct. 12 – 20	A variable stream of numerous spots, dying out past the central meridian.

Group 20495.	Oct. 18 – 25	A diminishing regular spot.
Group 20496.	Oct. 20 – Nov. 1	A stream of which the leading component, a regular spot, divides into two by October 24, and is the only surviving part on October 28.
Group 20497.	Oct. 22 – 23	A tiny spot.
Group 20498.	Oct. 22 – 23	A tiny spot on October 22; a pair on October 23.
Group 20499.	Oct. 23 – 27	A small stream of rapid initial growth.
Group 20500.	Oct. 26 – 28	A small scattered stream.
Group 20501.	Oct. 31 – Nov. 1	A few tiny spots.
Group 20502.	Nov. 1 – 5	A small bi-polar stream.
Group 20503.	Nov. 6 – 18	A stable regular spot.
Group 20504.	Nov. 12 – 18	A scattered cluster.
Group 20505.	Nov. 12 – 22	A stream, of which the leader becomes a regular spot on November 18 and alone remains on November 20.
Group 20506.	Nov. 12 – 22	A scattered stream.
Group 20507.	Nov. 24 – 27	A short-lived stream.
Group 20508.	Nov. 25 – Dec. 7	A regular spot until December 5, when it begins to break up.
Group 20509.	Nov. 30 – Dec. 8	A tiny spot which develops into a bi-polar group on December 1, and breaks up after December 5.
Group 20510.	Dec. 3 – 14	A regular spot which develops a double umbra by December 9, and then breaks up into a small scattered cluster.
Group 20511.	Dec. 4 – 7	A small stream.
Group 20512.	Dec. 6 – 10	One or two tiny scattered spots.
Group 20513.	Dec. 12 – 13	Two or three tiny spots.
Group 20514.	Dec. 14 – 15	A tiny cluster on December 14; a single spot on December 15.
Group 20515.	Dec. 17 – 19	A pair of small spots, of which only the follower remains on December 19.
Group 20516.	Dec. 18 – 24	A stream of spots appearing near the central meridian and dying out as it approaches the west limb.
Group 20517.	Dec. 23 – 25	A single small spot on December 23; a pair of spots on the other days.
Group 20518.	Dec. 24 – 26	Tiny variable spots.
Group 20519.	Dec. 31 – Jan. 5	A tiny spot developing into a cluster.

GENERAL CATALOGUE OF GROUPS OF SUNSPOTS FOR THE YEAR 1962

Groups of sunspots, lasting for two or more days, are numbered in the *first* column in continuation of the group numbers given in *R. Obs. Bulletin* No. 144. Groups seen on one day only are not included in this catalogue but are given with a distinctive numeration in a following table on p. 46.

The *second* column gives the U.T. of the central meridian passage of each group as deduced from its mean longitude (given in the *tenth* column). For those groups which are in existence at the time of the central meridian passage of their longitude, the time is given to $0^d{\cdot}01$, corresponding to $0°{\cdot}13$ of solar longitude. In other cases, in which groups disappear before or appear after the central meridian, the deduced time is given to $0^d{\cdot}1$.

The *third* column gives the duration of each group in days. Intermittent groups, *i.e.* groups which are not seen upon the photographs of every day between their first and last appearances, are indicated by a fraction, the numerator of which represents the number of days on which they are actually observed, the denominator being the number of days covering the extreme limits of observation.

The *fifth* and *seventh* columns, headed 'Longitude from central meridian', give, for the days on which each group was first and last seen respectively, the heliographic longitude from the meridian passing through the centre of the Sun's disk at the time of observation, longitudes west of the centre being reckoned as positive.

The mean areas for umbrae and whole spots entered in the *eighth* and *ninth* columns are corrected for the effect of foreshortening and are expressed in millionths of the Sun's visible hemisphere.

The *tenth* and *eleventh* columns give the mean heliographic position of the group in longitude and latitude respectively.

When a group is 80° or more from the Sun's central meridian, or in cases of close proximity to the Sun's limb when only part of the group is visible, the measures for that day are not included in deriving the mean area or the mean longitude and latitude of the group.

The *twelfth* column gives reference to recurrent groups. The numeration is in continuation of the recurrent series given in Ledger I of the *Greenwich Photo-Heliographic Results* for 1955; bracketed numbers indicate the order of a group in the series.

With reference to the identification of recurrent groups, it should be noted that longitudes are based on the ephemeris given in the *Astronomical Ephemeris*, assuming a solar rotation period constant at all latitudes. After an interval of one rotation, recurring groups will, therefore, show in general—apart from any proper motion they may have of their own—apparent drifts in longitude varying in amount according to their respective latitudes. The following table, derived from the formula $\xi = 14°{\cdot}37 - 2°{\cdot}60 \sin^2\phi$, gives the apparent drift in longitude appropriate to different latitudes after an interval of 27 days, a drift forwards corresponding to an increase in heliographic longitude.

Latitude	Drift *forwards*	Latitude	Drift *backwards*
0°	5°	20°	3°
5°	4·5	25°	7·5
10°	3	30°	12·5
15°	0·5	35°	18

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbrae	Whole Spots	Long.	Lat.	
	1962	d	1962	°	1962	°			°	°	
20366	Jan. 8·12	7	Jan. 2	−72	Jan. 8	+ 1	7	47	220·3	+16·1	
7	9·0	4	12	+46	15	+82	3	35	208·7	+ 4·4	
8	19·23	7	13	−75	19	+ 7	4	40	73·9	+14·0	1932 (2)
9	10·3	3	14	+55	16	+79	23	121	191·6	+ 9·8	
20370	24·15	13	18	−77	30	+76	137	935	9·2	+ 6·1	
1	24·74	7	22	−31	28	+49	15	98	1·5	+20·3	
2	20·0	3	23	+44	25	+71	2	17	63·4	+12·3	
3	29·78	14	23	−76	Feb. 5	+84	94	705	295·1	+10·5	1933 (1)
4	30·5	5	25	−70	Jan. 29	−15	1	15	285·6	−10·1	
20375	27·63	3	27	− 6	29	+26	1	8	323·4	−11·2	
6	Feb. 5·05	13	30	−74	Feb. 11	+83	12	84	212·6	+ 5·9	
7	6·00	8	31	−76	7	+20	10	45	200·1	+ 8·6	
8	5·87	4	Feb. 5	− 7	8	+36	6	32	201·7	+ 5·8	
9	17·6	3	12	−69	14	−45	0	4	46·8	+15·3	
20380	19·8	5	14	−71	18	−17	0	8	18·3	+11·9	
1	19·88	12	14	−73	25	+72	33	181	17·2	+ 5·2	
2	23·0	4	17	−75	20	−35	2	15	335·6	−12·1	
3	25·63	14	19	−85	Mar. 4	+82	123	1043	301·6	−10·8	1934 (1)
4	26·25	13	20	−80	4	+82	82	488	293·4	+10·7	1933 (2)
20385	23·4	3	21	−27	Feb. 23	− 2	2	19	331·5	− 8·4	
6	28·2	2	23	−64	24	−51	2	32	267·7	+16·1	
7	24·77	3	24	− 8	26	+20	2	13	312·9	+12·8	
8	25·46	4	24	−13	27	+27	0	12	303·8	+ 6·0	
9	Mar. 3·84	8	26	−75	Mar. 5	+23	1	14	219·7	+ 7·3	
20390	4·77	11	27	−74	9	+65	13	77	207·4	+ 7·0	
1	Feb. 26·9	2	Mar. 2	+47	3	+59	0	17	284·8	− 8·3	
2	Mar. 7·10	6	5	−25	10	+44	3	30	176·7	+13·2	
3	18·46	8	13	−69	20	+26	11	113	27·0	+11·1	
4	20·3	3	15	−66	17	−37	0	10	2·7	+ 8·0	
20395	22·90	11	17	−72	27	+61	3	27	328·5	+10·1	
6	24·43	10	18	−80	27	+38	4	34	308·4	−10·5	1934 (2)
7	19·2	2	19	+ 2	20	+17	1	8	18·0	−21·3	
8	24·4	4	19	−68	22	−27	2	15	308·1	− 8·1	
9	25·49	13	19	−81	31	+74	145	1049	294·4	+ 9·8	1933 (3)
20400	24·6	2	20	−56	21	−39	0	9	306·7	−15·2	
1	18·8	3	21	+34	23	+64	4	23	22·4	+11·4	
2	27·5	3	21	−79	23	−50	2	45	268·1	+16·2	
3	24·0	2	22	−22	23	− 7	0	8	313·6	−14·2	
4	23·4	4/6	23	+ 1	28	+67	1	14	321·5	+11·8	
20405	30·9	2	29	−17	30	− 7	0	11	223·4	+14·3	
6	31·2	2	29	−23	30	−12	0	15	218·5	−13·4	
7	Apr. 3·19	10	30	−57	Apr. 8	+71	7	39	179·6	− 7·5	
8	Mar. 31·5	6	Apr. 1	+10	6	+83	21	116	215·0	+ 5·8	
9	Apr. 4·5	5	6	+25	10	+81	10	100	163·0	+10·3	
20410	3·8	2	8	+59	9	+73	0	7	171·3	− 6·0	
1	14·38	10	11	−41	20	+77	40	276	31·9	+10·4	
2	17·7	7	11	−82	17	− 6	15	100	348·4	− 8·0	
3	17·3	2	12	−65	13	−52	0	9	354·0	+24·8	
4	18·48	13	12	−83	24	+80	36	215	337·7	+ 6·1	
20415	19·04	12	13	−79	24	+78	41	286	330·4	+ 8·5	
6	20·94	9	15	−74	23	+33	9	60	305·3	+ 9·8	
7	22·13	5	19	−35	23	+16	0	16	289·5	+11·9	
8	18·3	3	21	+41	23	+69	4	34	340·8	+14·1	
9	22·21	5	21	− 9	25	+40	8	60	288·5	−12·3	

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbræ	Whole Spots	Long.	Lat.	
	1962	d	1962	°	1962	°			°	°	
20420	Apr. 30·97	14	Apr. 24	−86	May 7	+84	85	581	172·7	+ 8·7	
1	29·68	2	28	−18	Apr. 29	+ 1	1	13	189·8	+11·2	
2	26·3	2	29	+46	30	+57	1	7	235·1	+ 5·1	
3	May 1·12	2	30	− 6	May 1	+ 2	0	5	170·7	− 6·2	
4	6·08	9	30	−74	8	+31	13	96	105·3	+19·5	
20425	3·07	3	May 1	−25	3	+ 6	0	11	145·0	+18·5	
6	7·42	7 / 8	6	−16	13	+82	23	166	87·5	−18·3	
7	10·89	9	6	−61	14	+45	5	26	41·6	+15·2	
8	14·69	13	8	−84	20	+75	32	198	351·3	− 9·1	1935 (1)
9	22·51	8	16	−83	23	+11	5	23	247·9	+ 5·2	
20430	22·6	3	17	−66	19	−45	0	13	246·6	− 7·4	
1	19·0	2	19	+ 5	20	+16	0	6	293·8	+13·7	
2	26·23	13	20	−77	June 1	+78	45	294	198·7	+15·2	
3	27·76	14	21	−84	3	+86	103	696	178·4	− 7·9	1936 (1)
4	27·6	3	28	+10	May 30	+37	3	23	181·0	+11·8	
20435	June 3·3	3	31	−40	June 2	−12	0	12	91·3	−17·9	
6	5·77	6 / 7	June 2	−45	8	+32	5	29	59·3	+ 8·8	
7	7·3	2	3	−52	4	−40	1	14	39·2	− 7·0	
8	3·3	2	4	+12	5	+28	0	7	91·5	−18·3	
9	9·0	3 / 4	4	−64	7	−21	1	10	16·3	+ 4·3	
20440	10·96	11	5	−77	15	+59	14	91	350·5	− 7·7	1935 (2)
1	7·6	2	8	+ 9	9	+24	1	10	35·5	+ 4·9	
2	14·70	12	9	−71	20	+79	10	76	301·1	−11·7	
3	17·2	3	11	−76	13	−52	2	31	267·7	+ 5·9	
4	16·54	9	13	−41	21	+63	3	24	276·7	+10·5	
20445	15·99	4	15	− 8	18	+33	3	22	284·0	+ 3·3	
6	17·0	2	15	−19	16	− 8	0	7	271·2	+ 4·9	
7	17·12	5	15	−21	19	+29	3	28	269·0	−14·8	
8	22·0	3	16	−73	18	−48	0	11	205·0	+15·3	
9	23·05	9	17	−79	25	+28	13	102	190·5	+16·1	
20450	23·9	6	18	−73	23	− 9	2	12	179·5	− 8·7	1936 (2)
1	30·31	13	24	−80	July 6	+85	93	544	94·4	0·0	1937 (1)
2	July 1·15	11	25	−80	5	+56	20	134	83·3	−20·3	
3	1·70	3	30	−18	2	+10	2	21	76·0	−24·5	
4	4·5	2	30	−55	1	−42	0	19	38·8	− 8·2	
20455	6·3	2	July 6	+ 4	7	+14	0	11	14·7	+20·1	
6	12·65	13	6	−79	18	+75	58	337	291·1	+ 9·6	
7	17·2	2	13	−53	14	−35	0	15	231·0	−10·5	
8	11·2	2	14	+43	15	+57	0	8	310·7	+ 0·7	
9	19·9	5	14	−71	18	−20	0	5	195·6	+11·0	
20460	13·6	3	16	+37	18	+63	0	5	278·3	−11·7	
1	22·1	6	16	−76	21	− 8	1	9	166·0	+ 5·0	
2	27·1	3	21	−76	23	−49	0	18	100·5	+ 5·1	
3	27·30	10	21	−78	30	+40	5	41	97·3	+ 0·7	1937 (2)
4	Aug. 3·0	2	Aug. 4	+17	Aug. 5	+32	2	9	8·7	− 2·5	
20465	6·93	3	6	− 9	8	+19	1	14	316·7	+ 7·0	
6	13·38	8	12	−15	19	+77	35	215	231·3	+ 5·9	
7	19·68	13	13	−82	25	+76	27	124	148·1	+ 1·5	
8	20·39	8	17	−41	24	+53	8	62	138·7	+ 2·3	
9	19·1	3	19	+ 2	21	+29	0	10	155·5	+ 4·7	

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P. 1962/63	Duration d	First Seen Date 1962	First Seen Long. from C.M. °	Last Seen Date 1962/63	Last Seen Long. from C.M. °	Corrected Mean Area Umbrae	Corrected Mean Area Whole Spots	Mean Position Long. °	Mean Position Lat. °	Reference
20470	Aug. 24·7	2	Aug. 19	−72	Aug. 20	−57	0	6	81·5	+10·7	
1	18·7	2	23	+59	24	+76	14	101	160·4	−13·1	
2	Sept. 1·7	2	26	−84	27	−71	0	11	336·0	+ 7·8	
3	2·36	11	27	−80	Sept. 6	+56	10	55	327·4	− 6·0	
4	2·67	11	30	−46	9	+85	65	462	323·2	+ 9·9	
20475	7·81	14	Sept. 1	−85	14	+87	66	387	255·4	+ 6·0	1938 (1)
6	6·03	4	3	−37	6	+ 8	0	4	278·9	+14·5	
7	9·37	13	3	−79	15	+80	33	201	234·7	−12·8	
8	10·0	4	4	−73	7	−35	3	20	226·3	− 6·9	
9	14·9	5	8	−83	12	−30	3	28	161·8	+23·9	
20480	16·96	12	11	−77	22	+72	55	308	134·5	+21·7	
1	12·71	3	12	− 4	14	+22	2	8	190·7	− 9·0	
2	18·3	4	13	−66	16	−26	1	11	117·4	+13·2	
3	21·02	3	20	− 9	22	+18	3	21	81·0	−16·7	
4	26·59	12	21	−74	Oct. 2	+80	25	137	7·4	+ 8·5	
20485	28·71	8 / 9	22	−83	Sept. 30	+26	0	15	339·4	+11·3	
6	21·8	3	23	+21	25	+46	2	18	71·0	+18·4	
7	24·0	4	25	+16	28	+59	9	43	41·5	+14·8	
8	Oct. 4·99	13	28	−85	Oct. 10	+70	30	202	256·6	+ 6·9	1938 (2)
9	2·6	3	30	−25	2	− 5	2	21	287·9	−10·8	
20490	5·8	2	Oct. 6	+ 6	7	+21	1	21	245·3	+11·0	
1	11·46	12	6	−71	17	+81	15	90	171·3	+ 2·2	
2	12·31	8	7	−68	14	+28	11	76	160·1	+ 4·6	
3	14·59	12	8	−83	19	+66	32	246	130·0	−12·6	
4	18·38	9	12	−80	20	+26	17	108	80·0	+ 3·0	
20495	24·82	8	18	−85	25	+10	12	67	355·1	+10·3	
6	26·06	13	20	−78	Nov. 1	+83	39	218	338·8	+10·0	
7	18·3	2	22	+53	Oct. 23	+71	0	12	81·0	−19·4	
8	20·1	2	22	+30	23	+48	1	13	57·8	− 0·8	
9	21·2	5	23	+30	27	+81	13	69	42·7	−13·4	
20500	31·7	3	26	−72	28	−44	3	42	264·0	+16·6	
1	1·4	2	31	−13	Nov. 1	− 2	2	15	254·8	+ 5·2	
2	Nov. 1·36	5	Nov. 1	− 1	5	+51	3	33	255·6	−15·2	
3	12·34	13	6	−80	18	+78	73	365	110·8	−14·1	
4	12·99	7	12	− 6	18	+69	18	98	102·3	+19·2	
20505	17·04	11	12	−61	22	+73	21	135	48·9	+13·0	
6	17·11	11	12	−64	22	+67	4	43	47·9	−15·5	
7	23·0	4	24	+17	27	+57	3	27	330·2	+ 7·5	
8	Dec. 1·26	13	25	−80	Dec. 7	+82	30	152	221·5	+ 1·0	
9	3·04	9	30	−37	8	+72	15	87	198·0	+16·4	
20510	9·62	12	Dec. 3	−82	14	+63	22	119	111·3	−13·2	
1	5·93	4	4	−21	7	+23	2	28	159·9	+18·1	
2	12·1	5	6	−76	10	−20	0	12	78·3	−15·9	
3	16·3	2	12	−51	13	−36	3	21	23·7	− 4·4	
4	14·98	2	14	− 7	15	+ 5	2	16	40·7	−12·6	
20515	14·2	3	17	+44	19	+68	16	75	50·5	−14·5	
6	18·61	7	18	− 5	24	+78	31	200	352·8	+ 8·7	
7	28·6	3	23	−71	25	−43	1	27	220·7	+ 7·8	
8	20·4	3	24	+50	26	+79	0	28	329·2	+ 8·5	
9	Jan. 5·5	6	31	−75	Jan. 5	− 1	2	14	116·8	+ 3·2	

GENERAL CATALOGUE OF SUNSPOTS

SUNSPOTS SEEN ON ONE DAY ONLY

The groups of sunspots tabulated below were seen on one day only and appear in the *Daily Results* with a distinctive numeration, comprising the number of the rotation during which each was observed prefixed by a number, in smaller type, given in order of appearance. These short-lived groups were usually composed of one or two very small spots. The deduced time of central meridian passage of each spot is given in the fourth column of the table.

Number of Group	Date	Longitude from Central Meridian	U.T. of Central Meridian Passage	Area Corrected for Foreshortening		Position of Group	
				Umbræ	Whole Spots	Longitude	Latitude
	1962	°	1962			°	°
1449 01	Jan. 5	−25·2	Jan. 7·2	0	14	232·5	−13·8
02	10	+48·1	6·8	0	17	237·4	+ 5·7
03	14	−75·9	20·2	0	9	60·6	+13·9
1450 01	30	+19·8	29·0	0	1	305·8	−18·1
02	Feb. 6	+55·7	Feb. 2·1	0	17	251·9	−10·3
03	11	+59·1	7·0	0	11	187·2	+ 8·2
04	14	+28·9	12·2	1	15	118·1	+ 0·1
05	18	+37·6	15·7	0	3	72·7	+17·1
1451 01	24	+ 1·1	24·2	0	4	320·0	+11·8
02	27	−60·6	Mar. 4·0	0	7	217·6	+ 5·1
03	Mar. 4	−48·3	8·1	0	7	162·9	− 8·2
04	7	+51·2	3·5	0	18	224·5	+ 5·0
1452 01	23	−13·5	24·5	0	7	306·8	−15·2
02	24	+ 9·2	23·6	0	10	318·7	−12·3
03	24	+ 2·3	24·2	0	6	311·8	− 8·1
04	Apr. 1	+21·7	30·7	2	14	225·6	+14·4
1453 01	20	+ 2·8	Apr. 20·2	0	7	315·4	− 8·7
02	22	+32·2	19·9	0	8	318·5	− 8·4
03	25	−26·9	27·4	0	8	220·3	−17·7
04	28	−50·7	May 2·2	0	11	156·5	+ 9·8
05	May 4	+71·6	Apr. 28·9	12	74	200·0	+16·3
06	10	−18·4	May 11·7	0	5	30·5	+13·9
1454 01	20	+53·8	16·3	0	4	330·4	+11·4
02	22	+ 7·3	21·7	0	7	257·9	+ 4·8
03	25	+30·0	23·1	0	4	240·5	+ 6·2
04	June 9	+50·4	June 5·5	0	9	62·4	+ 7·1
1455 01	17	+27·1	15·3	0	7	293·6	+12·8
02	21	+51·8	17·6	0	2	263·1	+ 8·9
03	22	+75·0	16·9	0	37	272·5	−13·3
04	22	+ 3·2	22·3	0	3	200·6	+19·2
05	25	+68·6	20·1	8	50	229·1	+ 5·8
06	26	+63·4	21·5	0	8	210·6	+12·2
07	July 1	−24·2	July 3·2	0	14	56·1	− 5·6
1456 01	8	−46·8	11·9	0	5	300·9	−10·5
02	11	−52·4	15·3	0	4	256·1	+14·8
03	18	−11·3	19·2	0	1	204·8	+22·1
04	18	−15·7	19·5	0	1	200·4	+18·2
05	21	+ 4·0	21·1	0	8	179·5	− 8·1
06	Aug. 2	−46·3	Aug. 5·8	0	4	331·2	+ 8·4
1457 01	5	−43·5	8·7	0	3	293·8	+11·6
02	6	+ 0·9	6·3	0	1	325·6	+ 9·8
03	7	+ 9·2	7·0	0	6	316·3	+14·1
04	8	+ 9·4	7·6	0	14	307·7	+12·9
05	13	−61·4	18·0	0	9	170·7	+23·9
1458 01	Sept. 15	+ 7·8	Sept. 14·8	0	15	163·3	+ 3·0
02	20	−68·8	25·6	0	7	20·9	+12·5

GENERAL CATALOGUE OF SUNSPOTS

SUNSPOTS SEEN ON ONE DAY ONLY

Number of Group	Date	Longitude from Central Meridian	U.T. of Central Meridian Passage	Area Corrected for Fore-shortening		Position of Group	
				Umbræ	Whole Spots	Longi-tude	Lati-tude
	1962	°	1962			°	°
1459 01	Sept 27	−29·3	Sept 29·5	1	6	328·5	+12·4
02	Oct. 20	+22·1	Oct. 18·6	0	17	76·7	− 1·2
03	23	+37·4	20·8	0	7	48·5	+ 1·3
04	Sept 23	+ 7·2	23·1	0	2	18·2	+ 5·2
05	23	− 4·2	23·9	0	7	6·9	+ 9·9
1460 01	24	+18·8	23·2	0	12	16·1	+ 0·7
02	25	+ 2·3	25·4	0	14	347·5	+12·0
03	Nov. 7	−57·4	Nov. 11·8	0	2	117·9	+ 9·1
1461 01	Dec. 6	−38·0	Dec. 9·3	1	6	114·8	+10·7
02	14	+ 3·0	14·3	2	15	50·0	−15·1
1462 01	18	−21·7	20·1	0	18	332·7	−11·7
02	20	− 2·6	20·5	0	13	328·3	+ 7·7
03	21	+19·3	20·0	1	15	334·7	−10·3

TOTAL AREAS OF SUNSPOTS AND FACULAE

Projected and Corrected for Foreshortening for each day

The place where the photograph was taken is indicated in the second column. A photograph taken at Herstmonceux is indicated by the letter H, and those taken at the Cape and Kodaikanal by the letters C and K respectively.

The projected area is the area as it is measured on the photograph, uncorrected for foreshortening and expressed in millionths of the Sun's apparent disk.

The area corrected for foreshortening is expressed in millionths of the Sun's visible hemisphere.

The areas of faculae are given separately for the Sun's western and eastern hemispheres.

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1962

Date and Place		Projected Area				Corrected Area			
		Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
JANUARY									
1	C	51	282	755	262	65	360	898	296
2	H	24	144	628	292	37	226	795	354
3	H	19	125	508	530	28	239	832	559
4	C	13	109	619	294	11	91	654	341
5	C	13	90	702	755	9	58	764	956
6	C	6	44	472	566	4	26	560	619
7	C	6	34	671	460	3	19	816	568
8	C	2	23	314	776	1	12	345	874
9	C	0	0	472	681	0	0	524	775
10	H	0	22	599	414	0	17	663	493
11	H	0	0	500	348	0	0	652	537
12	H	2	9	609	402	1	7	771	512
13	H	0	28	562	465	0	44	715	507
14	H	23	170	507	507	29	224	634	635
15	H	14	145	529	560	25	250	699	623
16	C	23	151	532	552	65	330	827	648
17	H	2	37	217	390	1	21	250	485
18	H	8	166	205	680	17	326	309	873
19	C	82	557	104	731	96	639	125	808
20	C	218	1282	577	765	180	1071	661	905
21	C	339	1945	346	566	221	1275	365	582
22	H	336	2283	206	455	187	1275	246	576
23	H	353	2495	499	498	193	1393	578	760
24	C	359	2506	629	797	218	1562	776	1035
25	C	384	2627	262	808	237	1611	371	889
26	C	345	2375	379	747	217	1483	487	863
27	C	305	2089	629	567	205	1398	671	706
28	H	249	1408	900	489	196	1145	1007	548
29	H	200	1818	673	521	167	1514	820	600
30	H	141	1424	685	577	81	850	859	729
31	C	198	1554	314	734	117	956	385	845
FEBRUARY									
1	H	233	2011	499	585	160	1337	604	708
2	H	239	1651	964	781	183	1265	946	862
3	C	208	1428	811	347	189	1348	965	468
4	H	128	773	565	283	184	1114	822	348
5	H	48	244	641	358	85	420	760	427
6	C	38	225	526	400	20	124	559	531
7	H	9	113	239	239	5	66	302	276
8	H	26	156	412	293	19	112	457	354
9	H	32	147	564	348	29	138	689	545
10	C	13	80	599	316	18	115	727	483
11	H	7	46	207	391	30	161	310	556
12	C	0	4	567	611	0	6	722	815
13	H	0	4	478	741	0	4	652	942
14	H	24	213	272	925	39	338	337	1135
15	C	36	261	315	971	36	264	479	1157
16	C	57	355	318	983	44	272	480	1075
17	H	63	369	402	447	38	233	570	536
18	C	78	380	475	570	45	217	644	802
19	C	91	408	424	930	69	387	543	1304
20	C	140	867	435	838	201	1379	580	1122
21	C	245	1713	645	1270	224	1628	778	1369
22	H	355	2333	341	899	258	1713	413	1005
23	C	365	3115	711	753	234	1962	793	824
24	C	450	3405	689	553	256	1915	749	632
25	C	443	3241	689	382	241	1709	911	454
26	C	452	2792	435	329	233	1446	717	514
27	H	446	2983	220	483	261	1747	288	574
28	C	407	2735	425	627	264	1732	513	684

Date and Place		Projected Area				Corrected Area			
		Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
MARCH									
1	C	285	2218	883	628	213	1671	900	712
2	H	176	1589	1341	594	176	1621	1465	706
3	H	124	889	703	253	188	1581	878	301
4	H	37	250	561	330	73	498	808	353
5	H	22	128	418	385	11	69	509	446
6	H	20	212	275	88	11	115	305	99
7	H	11	143	407	484	7	88	484	556
8	H	7	82	440	352	4	51	499	349
9	H	8	55	363	561	7	50	418	647
10	C	2	11	448	691	2	8	520	833
11	C	0	0	630	619	0	0	730	765
12	C	0	0	427	543	0	0	514	669
13	H	18	249	506	616	27	377	631	733
14	H	31	230	165	1039	29	214	194	1167
15	H	18	199	388	777	13	147	447	860
16	H	13	144	198	632	8	90	199	655
17	H	16	98	266	634	9	65	302	866
18	C	17	121	356	882	22	174	388	1054
19	H	88	678	455	1318	261	2004	618	1743
20	H	122	1163	410	1816	161	1572	518	2091
21	H	234	1771	576	972	204	1551	681	1071
22	H	263	2100	698	1075	188	1510	770	1123
23	H	349	2215	699	544	204	1307	825	627
24	H	319	2037	865	389	173	1109	1036	475
25	H	276	2038	422	344	145	1073	532	455
26	H	242	1708	433	511	130	922	511	582
27	H	220	1592	389	613	129	934	424	649
28	H	206	1463	1158	579	139	981	1242	604
29	H	93	716	1605	534	88	651	1719	625
30	C	82	604	1266	475	106	731	1535	511
31	C	37	190	693	400	68	319	967	456
APRIL									
1	H	42	213	446	491	22	113	631	637
2	H	69	338	267	367	39	192	344	402
3	H	51	335	646	324	33	204	711	369
4	C	53	329	736	282	35	215	808	309
5	H	28	118	624	536	21	109	731	619
6	H	22	76	651	347	15	94	797	453
7	C	24	139	509	619	18	103	547	670
8	C	18	178	651	510	16	157	688	557
9	H	13	165	404	460	16	211	509	563
10	H	4	42	281	281	17	157	441	318
11	C	11	95	217	573	37	291	230	705
12	H	54	353	359	932	84	603	448	1277
13	H	99	707	327	766	93	844	410	1004
14	H	166	1379	494	944	116	973	570	980
15	C	233	1619	229	828	153	1124	261	965
16	C	255	1668	393	949	163	1051	454	1191
17	H	255	1831	338	800	156	1115	375	863
18	C	274	1434	621	732	161	884	711	780
19	H	253	1397	597	495	159	864	731	547
20	H	218	1109	563	339	133	715	744	398
21	H	140	1093	518	405	90	676	611	522
22	H	122	939	811	429	92	682	912	554
23	C	101	590	834	550	98	564	1048	604
24	H	20	181	633	406	28	477	773	457
25	H	45	414	861	316	76	689	934	466
26	H	136	752	892	587	140	792	1061	660
27	H	147	1018	656	508	107	744	896	545
28	H	206	1272	328	801	129	802	569	886
29	H	170	1146	791	419	92	621	890	512
30	H	158	1031	238	487	84	562	263	554

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1962

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
MAY								
1 H	233	1241	421	296	134	722	512	356
2 H	186	1225	445	534	113	769	512	552
3 H	182	1286	386	432	114	798	481	492
4 C	94	932	550	341	70	686	633	410
5 C	55	533	518	572	51	495	555	807
6 C	28	262	671	562	46	400	853	656
7 H	16	100	387	647	12	174	623	725
8 C	24	159	341	528	48	362	431	741
9 H	43	287	251	501	42	293	261	733
10 C	73	486	133	673	60	393	142	821
11 C	139	780	374	1001	109	618	468	1045
12 C	121	807	429	883	107	724	619	1039
13 C	79	631	411	898	96	666	589	1135
14 C	47	326	509	887	24	167	499	1040
15 C	62	368	688	1198	32	187	767	1213
16 C	53	303	587	639	43	233	726	758
17 H	54	401	547	455	41	296	594	537
18 H	59	251	536	732	46	198	643	908
19 C	36	195	842	854	34	183	874	920
20 H	51	302	756	402	112	617	959	738
21 C	60	427	1223	1289	101	718	1357	1586
22 H	121	1050	860	1226	152	1391	942	1646
23 H	214	1347	790	1031	194	1211	918	1137
24 H	271	1630	849	825	182	1119	1030	906
25 H	285	1619	781	138	166	940	933	117
26 C	249	1533	434	301	131	812	476	366
27 C	210	1490	703	579	107	760	777	635
28 H	213	1501	459	355	112	780	555	492
29 H	244	1325	447	586	138	750	542	683
30 C	221	1508	683	414	152	1023	745	436
31 H	170	1241	1059	450	152	1170	1217	544
JUNE								
1 H	85	619	1093	553	99	677	1315	722
2 H	47	377	955	1002	77	636	1187	1096
3 C	2	73	715	779	2	324	1104	817
4 H	0	33	599	1151	0	23	684	1329
5 H	7	141	392	795	16	197	486	1067
6 H	45	262	599	898	42	233	720	1033
7 H	48	235	460	1060	34	162	530	1209
8 H	29	218	473	656	17	130	626	799
9 C	44	397	550	729	24	251	741	868
10 H	56	255	461	853	34	159	518	960
11 H	28	215	507	967	15	136	629	1148
12 H	27	197	346	691	18	136	423	761
13 H	26	189	416	716	15	114	525	788
14 H	46	247	648	348	25	137	758	397
15 H	42	339	750	346	22	179	830	397
16 H	31	267	819	657	18	152	978	915
17 H	44	294	611	725	40	294	683	1038
18 H	29	249	833	1121	20	197	969	1311
19 H	47	411	726	910	47	365	789	982
20 C	15	291	911	865	19	326	1085	944
21 C	33	199	728	404	18	119	830	473
22 H	37	264	599	576	19	166	828	683
23 C	49	312	560	426	25	161	683	517
24 H	62	441	485	565	112	840	602	876
25 H	97	594	542	530	125	756	648	688
26 H	141	848	717	691	125	789	770	1050
27 H	188	1130	1074	578	130	793	1133	644
28 H	225	1329	1121	762	131	780	1279	852
29 H	292	1656	994	832	153	870	1184	962
30 H	223	1511	648	693	115	782	712	756

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
JULY								
1 C	224	1211	583	988	118	641	689	1083
2 C	152	864	223	706	87	496	251	854
3 H	127	706	404	1049	83	461	510	1197
4 C	108	605	696	796	89	500	790	893
5 C	60	379	808	807	82	518	937	861
6 H	45	283	691	796	160	950	990	1066
7 C	54	440	561	728	77	607	732	878
8 H	78	397	622	1084	71	358	738	1272
9 H	97	425	359	1109	67	295	427	1239
10 C	81	520	314	853	47	302	384	922
11 H	97	621	610	715	51	328	649	809
12 H	113	595	621	461	57	300	682	504
13 H	122	682	461	554	62	356	600	627
14 C	105	581	426	380	58	329	481	502
15 H	83	491	737	784	52	311	843	992
16 H	58	389	783	807	45	297	848	935
17 H	48	319	945	726	51	332	976	845
18 H	23	155	807	610	44	274	1032	734
19 C	0	11	640	560	0	7	791	645
20 H	5	23	622	541	3	13	861	579
21 H	7	77	391	439	16	136	525	651
22 H	9	76	737	426	10	86	841	523
23 H	14	111	656	530	11	89	664	558
24 H	7	76	842	645	4	49	817	738
25 H	5	42	899	795	3	23	959	858
26 C	0	22	951	906	0	11	1047	1008
27 H	0	23	715	508	0	12	838	610
28 C	0	36	623	723	0	19	765	844
29 C	2	45	527	639	1	25	646	755
30 C	0	36	334	648	0	24	393	743
31 H	0	0	818	772	0	0	847	890
AUGUST								
1 H	0	0	806	750	0	0	907	838
2 H	0	5	657	692	0	4	849	790
3 H	0	0	726	967	0	0	832	1158
4 C	7	31	629	739	4	16	744	821
5 H	0	7	667	877	0	4	803	1014
6 C	2	53	655	777	1	27	737	867
7 H	0	19	554	668	0	10	601	717
8 H	2	48	300	369	1	25	340	454
9 H	0	0	461	92	0	0	539	82
10 C	0	0	0	300	0	0	0	405
11 C	0	0	300	300	0	0	276	446
12 H	9	76	356	264	5	39	444	302
13 H	23	154	321	459	12	155	300	526
14 C	96	559	422	333	93	462	497	405
15 H	151	894	356	425	100	575	505	446
16 H	153	847	241	161	103	566	327	159
17 H	107	590	356	310	76	410	331	436
18 H	90	623	230	195	76	513	291	271
19 C	82	479	111	345	53	345	296	394
20 H	75	438	207	321	38	224	248	382
21 H	62	349	423	206	33	183	465	239
22 H	50	227	388	366	30	132	456	455
23 H	28	156	561	276	20	110	614	386
24 H	31	162	332	228	48	280	432	295
25 H	5	21	423	354	10	42	612	496
26 H	2	9	228	240	8	38	413	295
27 H	0	16	274	377	0	40	320	546
28 C	0	16	275	253	0	22	366	299
29 H	2	32	411	342	2	30	508	447
30 H	14	71	411	548	10	50	482	595
31 H	14	79	273	354	8	47	356	430

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1962

Date and Place		Projected Area				Corrected Area			
		Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
SEPTEMBER									
1	H	66	506	205	582	87	466	242	685
2	C	159	904	165	462	116	703	199	592
3	H	249	1548	136	797	182	1144	164	953
4	H	346	2470	306	873	238	1627	373	1053
5	H	352	2513	239	659	228	1625	293	719
6	H	324	2038	601	420	214	1360	588	502
7	H	314	1830	601	466	220	1325	652	545
8	H	265	1724	454	442	203	1374	747	632
9	H	234	1283	442	464	160	894	738	749
10	C	211	1079	242	913	122	629	289	1097
11	C	142	771	418	869	103	578	500	1029
12	H	133	839	442	600	119	767	446	677
13	H	165	979	601	408	161	990	685	452
14	H	180	781	429	408	159	845	528	437
15	H	165	1017	226	395	112	663	344	437
16	C	173	1084	340	373	91	571	327	455
17	H	128	702	237	215	66	366	257	223
18	H	71	693	495	270	39	377	515	383
19	H	88	528	632	192	53	318	687	249
20	H	57	217	586	169	41	161	727	212
21	H	38	231	337	327	33	200	346	402
22	H	51	242	383	405	58	287	497	534
23	H	55	271	304	271	39	202	486	348
24	K	79	327	166	800	48	207	211	1161
25	H	109	636	395	563	58	346	424	606
26	K	65	340	41	196	34	178	46	232
27	H	68	518	405	327	37	273	478	393
28	C	48	333	402	348	59	430	421	388
29	C	59	363	261	272	60	346	314	371
30	H	60	548	203	427	52	473	215	478
OCTOBER									
1	H	97	668	236	596	75	512	251	640
2	H	69	534	371	472	41	346	475	486
3	C	66	470	345	238	35	253	356	301
4	H	47	345	461	337	25	175	573	361
5	C	54	346	227	280	27	174	312	339
6	C	62	281	216	345	32	160	232	543
7	H	29	345	235	537	18	217	282	620
8	H	60	343	189	557	82	472	190	641
9	H	83	559	346	558	93	643	364	725
10	H	153	991	336	649	115	776	381	684
11	H	177	1124	402	468	106	667	479	437
12	H	126	1007	89	345	71	583	84	549
13	H	136	1034	100	244	87	643	109	271
14	H	148	1026	67	367	95	634	56	388
15	H	127	742	200	278	83	466	187	258
16	H	102	697	422	267	66	454	443	325
17	C	57	432	355	377	50	324	445	503
18	H	35	244	422	333	25	218	422	401
19	C	15	131	538	333	25	186	581	435
20	C	26	247	473	441	39	305	692	592
21	H	82	471	522	487	78	453	562	524
22	H	106	577	555	598	74	415	703	589
23	H	104	639	599	211	61	389	751	255
24	H	117	579	367	189	68	334	405	221
25	H	84	550	353	297	49	324	381	370
26	C	71	427	384	481	45	291	461	636
27	H	73	494	378	709	55	385	497	799
28	H	67	387	506	473	40	235	585	502
29	H	36	251	331	541	26	176	379	576
30	H	51	172	331	275	48	161	390	311
31	H	21	124	542	297	25	148	629	323

Date and Place		Projected Area				Corrected Area			
		Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
NOVEMBER									
1	C	0	70	320	363	0	75	449	442
2	H	4	51	297	583	2	28	366	815
3	C	17	92	138	627	10	54	149	818
4	H	4	63	715	517	3	45	860	559
5	K	0	20	403	384	0	17	415	425
6	C	19	134	999	394	61	432	1100	558
7	H	57	325	286	407	71	405	386	466
8	C	89	483	234	392	78	426	211	472
9	C	119	526	404	1006	83	365	453	1115
10	C	119	651	181	487	70	383	173	574
11	C	146	665	222	349	79	359	190	522
12	C	183	867	636	424	103	522	672	414
13	H	198	1026	352	451	107	578	428	490
14	C	257	1036	455	137	147	597	559	167
15	H	156	931	187	242	101	600	204	294
16	C	172	917	561	370	119	625	618	519
17	C	156	966	688	519	125	718	754	725
18	C	90	714	656	498	99	681	827	526
19	K	78	424	182	91	45	246	193	111
20	C	36	292	539	423	26	213	605	476
21	H	26	135	469	512	27	139	454	597
22	H	7	64	360	251	12	106	492	315
23	C	0	0	244	455	0	0	438	540
24	C	8	30	347	517	4	16	380	529
25	C	32	151	369	337	56	240	415	424
26	C	19	171	295	243	23	180	346	332
27	C	38	209	591	211	31	174	666	246
28	C	38	236	380	316	25	153	490	377
29	C	53	281	127	422	30	157	181	640
30	C	88	390	106	411	45	200	224	563
DECEMBER									
1	H	119	576	141	347	64	303	191	362
2	H	92	666	196	348	48	349	201	349
3	H	114	772	185	206	94	708	211	312
4	H	123	617	239	348	104	521	261	507
5	H	120	624	185	511	100	493	160	544
6	H	94	462	250	684	80	374	257	747
7	H	48	393	195	271	28	266	250	254
8	C	38	335	179	253	20	194	246	319
9	H	41	208	185	413	21	111	215	491
10	H	32	148	316	294	17	78	367	306
11	C	13	69	284	495	7	37	379	564
12	H	8	53	109	424	7	39	113	519
13	H	2	33	401	217	1	22	338	268
14	H	6	57	348	424	3	34	363	498
15	C	6	42	357	285	3	21	493	318
16	H	0	0	185	381	0	0	250	419
17	H	41	154	370	294	29	109	380	290
18	H	44	331	435	402	28	208	480	449
19	H	48	288	651	369	31	170	798	451
20	C	49	389	419	367	26	211	529	456
21	H	102	549	185	261	65	347	192	345
22	C	39	293	429	209	32	236	429	301
23	C	35	166	325	189	45	214	350	266
24	C	6	162	409	398	16	269	488	427
25	C	0	57	377	535	0	54	384	544
26	C	0	6	136	241	0	17	184	258
27	C	0	0	84	314	0	0	141	391
28	C	0	0	84	262	0	0	115	300
29	C	0	0	84	482	0	0	112	601
30	C	0	0	0	272	0	0	0	299
31	C	0	4	84	219	0	8	116	319

MEAN AREAS OF SUNSPOTS AND FACULAE FOR EACH ROTATION OF THE SUN FROM 1961 DECEMBER 29 TO 1963 JANUARY 13

The mean areas have been formed by taking the means of the areas for each day of observation throughout each rotation of the Sun, the projected areas being the areas as measured on the photographs and expressed in millionths of the Sun's apparent disk, and the areas corrected for foreshortening being expressed in millionths of the Sun's visible hemisphere.

The rotations adopted in the following table (which is in continuation of those for the years 1873–1961; see *R. Obs. Bulletin* No. 144, page C258, 1968) correspond to the synodic rotation of the Sun, and the commencement of each is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node of the Sun's equator on the ecliptic at mean noon on January 1, 1854, and the assumed period of the Sun's sidereal rotation being 25·38 days. The numeration of the rotations is in continuation of Carrington's series (*Observations of Solar Spots made at Redhill* by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The dates of commencement of the rotations are given in U.T.

No. of Rotation	Rotation Commenced	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
			Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1449	1961 December 28·51	27	78	527	1013	55	375	1226
1450	1962 January 24·85	27	122	853	1087	97	676	1347
1451	February 21·19	28	150	1099	1155	114	866	1363
1452	March 20·51	27	128	896	1173	91	649	1371
1453	April 16·80	27	130	849	1079	94	640	1298
1454	May 14·04	27	108	710	1429	83	563	1687
1455	June 10·24	28	90	562	1385	69	444	1633
1456	July 7·44	27	35	213	1343	24	147	1549
1457	August 3·65	27	37	218	741	27	159	894
1458	August 30·89	27	157	949	837	111	676	1017
1459	September 27·16	27	81	556	728	60	407	846
1460	October 24·44	28	86	473	842	60	337	984
1461	November 20·75	27	45	255	640	33	186	755
1462	December 18·07	27	20	136	628	16	106	749

MEAN AREAS OF SUNSPOTS AND FACULAE FOR THE YEAR

The mean projected areas are expressed in millionths of the Sun's apparent disk.

The mean areas corrected for foreshortening are expressed in millionths of the Sun's visible hemisphere.

Year	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
		Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1962	365	93	610	1019	68	458	1210

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR EACH ROTATION OF THE SUN, FROM 1961 DECEMBER 29 TO 1963 JANUARY 13

The numbers given in the accompanying table have been formed as follows:

The heliographic latitude of each spot for each day has been multiplied by its area (corrected for foreshortening), and the sum of the products, for spots north of the equator, has been divided by the sum of the corresponding areas to form the mean heliographic latitude of spotted area north of the equator; similarly for spots south of the equator. In forming the mean heliographic latitude of entire spotted area, the algebraic sum of the products for spots north and south of the equator has been divided by the sum of the areas; and for the mean distance from the equator of all spots the numerical sum of the products, without regard to the sign of latitude, has been similarly divided.

The mean areas have been formed by dividing the sum of the daily areas (corrected for foreshortening) by the number of days of observation for each rotation of the Sun and are expressed in millionths of the Sun's visible hemisphere.

No. of Rotation	Rotation Commenced	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
				°		°	°	°
1449	1961 December 28·51	27	349	7·60	26	4·15	+6·79	7·36
1450	1962 January 24·85	27	643	8·23	33	10·48	+7·47	8·32
1451	February 21·19	28	422	9·80	444	10·79	−0·76	10·31
1452	March 20·51	27	596	9·64	53	8·13	+8·19	9·52
1453	April 16·80	27	519	9·16	121	13·31	+4·91	9·94
1454	May 14·04	27	155	14·15	408	8·07	−1·95	9·74
1455	June 10·24	28	196	5·54	248	3·98	+0·22	4·67
1456	July 7·44	27	145	8·58	3	8·72	+8·27	8·58
1457	August 3·65	27	147	3·85	12	9·83	+2·79	4·31
1458	August 30·89	27	556	11·70	120	11·73	+7·53	11·70
1459	September 27·16	27	292	6·65	115	12·51	+1·24	8·31
1460	October 24·44	28	131	12·85	205	14·19	−3·64	13·67
1461	November 20·75	27	114	6·60	72	12·88	−0·91	9·02
1462	December 18·07	27	95	9·94	11	9·71	+7·93	9·92

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR THE YEAR

Year	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
			°		°	°	°
1962	365	320	9·23	138	9·28	+3·65	9·25

SUMMARY OF SOLAR ACTIVITY FOR THE YEAR 1962

Chief features of the record for 1962 are as follows:

(1) The decline in activity was continued rather more slowly than in the previous twelve months.

(2) The largest spot group crossed the Sun's central meridian on March 25·5 in latitude 10° North; its mean area was 1049 millionths.

In addition there were six other groups with mean areas exceeding 500 millionths, including one whose mean area exceeded 1000 millionths.

(3) On 19 days the Sun was free of spots.

(4) The ratio of mean corrected areas of faculae/sunspots was 2·13 and that of mean corrected areas of umbrae/whole spots 0·150.

(5) The number and distribution, northern and southern hemispheres, of spot groups of

(*a*) two days' duration or longer

(*b*) one day's duration

were as follows:

	(*a*)	(*b*)
Northern spots	101	41
Southern spots	53	18
Total	154	59

(6) The following table gives the mean daily areas of sunspots (projected and corrected values) and faculae (corrected only) for each calendar month:

Month	Spots		Faculae
	Projected	Corrected	Corrected
January	766	533	1261
February	1145	827	1350
March	803	693	1431
April	732	555	1282
May	824	634	1465
June	454	363	1678
July	330	263	1554
August	192	140	977
September	911	657	991
October	524	372	879
November	397	291	958
December	240	174	692

PHOTOHELIOGRAPHIC RESULTS

1963

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PHOTOHELIOGRAPHIC RESULTS 1963

INTRODUCTION

The photographs from which these measures were made were taken at the Royal Greenwich Observatory, the Royal Observatory, Cape of Good Hope, and the Kodaikanal Observatory, Southern India. One plate was also supplied by Mount Wilson and Palomar Observatories to fill a gap in the combined series.

The photographs of the Sun obtained at Herstmonceux were taken with the 4-inch photoheliograph, of which the original object-glass had been replaced in 1910 by a Grubb photographic objective. The equivalent focal length of the photoheliograph with its present enlarging system (supplied in 1926 by Ross, Ltd.) is 67½ feet, the diameter of the Sun's image at the secondary focus being approximately 7½ inches.

The photographs of the Sun obtained at the Cape Observatory were taken under the superintendence of Her Majesty's Astronomer at the Cape, Dr. R. H. Stoy, and those at Kodaikanal under the superintendence of the Director, Dr. M. K. Vainu Bappu. At the Cape Observatory the instrument employed was a 4-inch photoheliograph giving an image of the Sun about 7½ inches in diameter; at Kodaikanal a Cooke photo-visual objective of 6 inches aperture was used, the image of the Sun which was obtained being of about the same size.

Photographs of the Sun were available for measurement on 365 days in 1963, those finally selected for measurement being supplied by the different observatories as under:

Herstmonceux	243
Cape	113
Kodaikanal	8
Mount Wilson	1
Total	365

The names of the measurers of the photographs for the year 1963 were as follows:

P. S. Laurie	Miss D. M. Hobden
G. W. Rickett	Miss M. E. Winter

At the primary focus of the photoheliographs at Herstmonceux and the Cape two spider-wires are fixed by which the zero of position angles on the photographs can be determined. These wires are inclined at an angle of 45° to the celestial equator. In the Kodaikanal instrument there is one wire fixed parallel to the equator.

The precise zero of position angles for the photoheliographs has been determined by three different methods.

(i) *Zero Photographs.* Plates were exposed twice, with an interval of about 100 seconds between the two exposures, the instrument being firmly clamped. Two images of the Sun, overlapping each other by about a fifth part of the Sun's diameter, were thus produced upon the plates. The exposures were so made that the line joining the cusps passed approximately through the centre of the plates and the inclinations of the two spider-wires to this line were measured. A small correction for the inclination of the Sun's path has been applied. Two or three zero photographs were usually taken each month at Herstmonceux, the Cape and Kodaikanal.

(ii) *Transits.* At Herstmonceux and the Cape, transits of the Sun were taken visually, the times of contact of the first and second limbs of the Sun with the two wires being noted by an eye-and-ear method. The ratio of the time taken by the Sun to pass over the NE–SW wire to the time taken to pass over the SE–NW wire was used in order to find the angle made by the Sun's path with the bisectors of the wires. From this, again incorporating a correction to allow for the inclination of the Sun's path, the orientation of the wires with respect to the N–S line could be inferred. Transits were usually taken at Herstmonceux and the Cape on four or more days during each month.

(iii) *Supplementary Zero Photographs.* At Herstmonceux supplementary partial images of the Sun were occasionally recorded on otherwise normal photographs, a second exposure being made after clamping the instrument firmly for 130 seconds. The small portion of the Sun's limb visible at the western edge of the plate could be used, together with the main image which it does not intersect, to deduce the orientation of the wires in a way similar to that used for the zero photographs. Six to ten supplementary zero photographs were taken at Herstmonceux each month. The values for the zero of position angles deduced from them were given half weight in the adoption of zero corrections to be used in the reduction of photographs.

The measures of the photographs were made with a large position-micrometer that can be used for photographs of the Sun up to 12 inches in diameter. In this micrometer the photograph is held with its film-side uppermost on three pillars fixed on a circular plate, which can be turned through a small angle about a pivot in its circumference by means of a screw and antagonistic spring acting at the opposite extremity of the diameter. The pivot of this plate is mounted on the circumference of another circular plate which can be turned by a similar screw-action about a pivot in its circumference. This pivot, 90° distant from that of the upper plate, is mounted on a third circular plate, with a position-circle graduated in divisions of 30 minutes of arc, which may be rotated about its centre. By this means small movements in two directions at right angles to each other can be readily given and the photograph can be accurately centred with respect to the centre of rotation of the position-circle. When this has been done, a Ramsden eyepiece, having at its anterior focus a glass diaphragm ruled with cross-lines into squares with sides of one hundredth of an inch (for measurement of areas), is moved along a slide adjusted so that the centre of the eyepiece moves diametrically across the photograph, the diaphragm being nearly in contact with the photographic film, so that parallax is negligible. The distance of a spot or facula from the centre of the disk is read from a scale and vernier to 1/250th of an inch, corresponding to 0·001 of the Sun's radius for images 8 inches in diameter. The position angle is read from the large position-circle which rotates with the photographic plate. The photograph is illuminated by diffused light reflected from white paper placed at an angle of 45° below the photograph.

In the case of large or complex groups of spots, the chief components were measured individually; so also in the case of groups near to the east or west limbs of the Sun where the effects of foreshortening are appreciable. In other cases the position of the centre of a group was estimated by the measurer at the micrometer or derived during the computation.

When required, corrections have been applied to the measured distances and position angles to allow for differential refraction. The details of this correction were given in the *Introduction* to the *Greenwich Photo-Heliographic Results* for 1909. It is necessary to apply this correction to about twenty per cent of the photographs taken at Herstmonceux in the months October to March.

1. *Positions and Areas of Sunspots for each Day in the Year* 1963 (p. 60).

In this section the measured positions and areas of sunspots are given for each day. The positions of sunspots are referred firstly to a system of apparent polar co-ordinates on the Sun's disk and secondly to a system of heliographic co-ordinates. Notes on the sunspot groups are given at the end of this section (p. 84).

The calculations of heliographic longitude and latitude are made from formulae given by W. de la Rue, B. Stewart and B. Loewy, *Phil. Trans.*, 1869. The system of heliographic co-ordinates may be defined as follows. The inclination of the Sun's axis to the ecliptic is assumed to be 82° 45′, the longitude of the ascending node of the Sun's equator on the ecliptic for 1963·0 to be 75° 14′·6, and the period of the Sun's sidereal rotation to be 25·38 days. The meridian which passed through the ascending node on 1854 January 1, Greenwich mean noon, is taken as the zero meridian and longitudes increase from east to west. The mean synodic rotation period is 27·2753 days; synodic rotation periods are counted from 1853 November 9, in continuation of Carrington's series.

Let r be the measured distance of a spot from the centre of the Sun's apparent disk and χ the position angle of the spot from the Sun's axis, R the measured radius of the Sun on the photograph, S the tabular semi-diameter of the Sun in arc, and ρ, ρ' the angular distances of a spot from the centre of the apparent disk, as viewed from the Sun's centre and from the Earth respectively. ρ — the heliocentric angle — is obtained from the following equations:

$$\rho' = \frac{r}{R} S \qquad \sin(\rho + \rho') = \frac{r}{R}$$

If B_0 and ϕ are the heliographic latitudes and L_0 and λ the heliographic longitudes of the Earth and the spot respectively,

$$\sin \phi = \cos \rho \sin B_0 + \sin \rho \cos B_0 \cos \chi$$
$$\sin (L_0 - \lambda) = \sin \chi \sin \rho \sec \phi$$

χ is found from the position angle measured eastwards from the north point of the Sun's disk by subtracting P, the position angle of the north end of the Sun's axis also measured eastwards from the north point. The three quantities P, B_0 and L_0 for the time of the exposure of each photograph are derived from the *Ephemeris for Physical Observations of the Sun*, given on page 304 of the *Astronomical Ephemeris for* 1963.

2. *General Catalogue of Groups of Sunspots for* 1963 (p. 88).

This catalogue first contains particulars of every group of sunspots which lasted for two or more days during 1963. The group numbers are in continuation of those given in 1962 and previous years. The table includes an indication of those groups which may be considered to be members of 'recurrent series' of groups.

Spot groups seen on one day only are given in a separate table, where they receive a distinctive numeration.

Recurrent groups were selected upon the following plan, reference being made to the General Catalogue. If any spot when first seen was 60° or more to the east of the central meridian, the catalogue and, if necessary, the Daily Results also (Section 1), were searched some fifteen to sixteen days earlier to ascertain whether a spot group of similar heliographic longitude and latitude was then near the west limb of the Sun. Similarly, if any spot group when last seen was 60° or more to the west of the central meridian, a search was made fifteen to sixteen days later. When there appeared to be a case of probable continuity between groups in consecutive rotations of the Sun, the character of the groups, their areas and their longitude and latitude have been carefully compared before accepting them as a recurrent group.

3. *Total Areas, Mean Areas and Mean Heliographic Latitudes of Sunspots and Faculae in the Year* 1963 (p. 94).

This section contains total areas of sunspots and faculae (the latter separated into west and east hemispheres) for each day in the year, together with mean areas and mean heliographic latitudes of sunspots and faculae for each rotation of the Sun during 1963. Similar annual mean values are also given.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR 1963

The first line for each day gives the month numerically, the date and decimal of a day reckoned from midnight, the position angle of the Sun's axis from the north point and the heliographic longitude and latitude of the centre of the disk, all being computed for the time of the photograph.

Col. 1. Number of spot group in order of appearance and in continuation of the group numbers for 1962. Single figures (1 = leader, 2 = follower) beneath the number of a spot group indicate the principal and most stable components of that group. (The areas of such components are already included in the total area of the group.) Groups seen on one day only are distinguished by the number of the rotation during which they were observed and prefixed by a number in smaller type giving the order of their appearance.

Col. 2. Distance of spot group from Sun's centre in units of the Sun's radius.

Col. 3. Position angle of spot group measured from the north pole of the Sun's axis in the direction *N. E. S. W. N.*

Col. 4. Heliographic longitude of spot group derived from the measures.

Col. 5. Heliographic latitude of spot group similarly derived.

Col. 6. Area of umbrae corrected for foreshortening and expressed in millionths of the Sun's visible hemisphere.

Col. 7. Area of whole spots composing the group similarly expressed.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
01	1·293	+ 2·2	172·6	− 3·1		
20520	·513	45·6	150·0	+18·1	7	63
20519	·838	84·0	116·2	+ 3·3	5	30
01	2·336	+ 1·7	158·9	− 3·2		
20520	·401	22·5	149·6	+18·5	15	82
20521	·670	88·4	117·0	− 1·2	0	14
20519	·679	82·1	116·7	+ 3·0	3	15
01	3·294	+ 1·2	146·3	− 3·3		
20522	·533	262·4	178·3	− 6·8	1	18
20520	·380	350·5	150·1	+18·7	4	57
20519	·475	78·0	118·7	+ 2·8	0	7
20521	·507	85·0	116·1	− 0·3	0	11
01	4·348	+ 0·7	132·4	− 3·4		
20522	·730	264·9	179·2	− 6·1	4	35
20520	·483	319·8	151·5	+18·4	5	33
20519	·268	65·3	118·4	+ 3·1	1	15
01	5·284	+ 0·3	120·1	− 3·5		
20522	·878	264·7	181·4	− 6·3	0	18
20519	·114	11·3	118·8	+ 2·9	0	7
041462	·197	14·9	117·1	+ 7·4	0	10
01	6·290	− 0·2	106·8	− 3·6		
20522	·960	264·3	180·7	− 6·4	0	46
01	7·352	− 0·7	92·8	− 3·7		
051462	·633	303·0	126·4	+17·1	8	38
01	8·298	·	·	·	0	0
01	9·473	·	·	·	0	0
01	10·492	− 2·2	51·5	− 4·1		
20523	·968	78·2	337·4	+10·3	33	160
01	11·473	− 2·7	38·6	− 4·2		
20523	·892	76·0	337·1	+10·5	36	162
01	12·486	− 3·2	25·2	− 4·3		
20523	·768	72·7	337·2	+10·4	29	174
01	13·484	− 3·7	12·1	− 4·4		
20523	·589	66·5	339·0	+ 9·8	27	127
01	14·461	− 4·1	359·2	− 4·5		
20523	·425	54·5	339·5	+10·0	32	153
20524	·416	63·6	338·0	+ 6·5	69	264
01	15·461	− 4·6	346·0	− 4·6		
20523	·272	23·6	339·7	+ 9·8	39	235
20524	·241	37·1	337·7	+ 6·5	56	323
01	16·080	− 4·9	337·9	− 4·7		
20523	·261	351·0	340·2	+10·2	32	183
20524	·203	358·2	338·2	+ 7·0	45	226
01	17·287	− 5·5	322·0	− 4·8		
20525	·670	287·7	2·0	+ 8·0	0	15
20523	·397	308·7	340·3	+ 9·8	34	210
20524	·339	305·3	338·1	+ 6·6	33	211
01	18·279	− 5·9	308·9	− 4·9		
20525	·806	283·7	1·0	+ 8·0	0	14
20523	·560	295·1	339·7	+ 9·5	33	210
20524	·522	291·3	338·1	+ 6·6	40	137

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1963		°	°	°		
01	19·281	− 6·4	295·7	− 5·0		
20523	·729	288·3	340·1	+ 9·7	35	161
20524	·703	284·2	338·8	+ 6·3	22	116
01	20·258	− 6·8	282·9	− 5·1		
20523	·862	284·2	340·6	+ 9·5	51	173
20524	·849	280·1	339·8	+ 5·8	12	51
01	21·469	− 7·4	266·9	− 5·2		
20523	·967	281·2	340·7	+ 9·4	29	178
20524	·954	278·3	338·4	+ 6·3	0	27
01	22·424	·	·	·	0	0
01	23·566	− 8·3	239·3	− 5·4		
01 1463	·366	48·1	223·4	+ 8·9	0	9
20526	·713	68·6	196·9	+11·1	1	17
01	24·281	− 8·7	229·9	− 5·4		
20526	·594	62·9	197·5	+11·1	1	12
01	25·489	− 9·2	214·0	− 5·5		
20527	·291	346·3	218·0	+10·8	2	22
20526	·392	42·3	198·4	+11·5	0	5
01	26·470	− 9·6	201·1	− 5·6		
20527	·393	314·0	217·7	+10·4	0	14
20528	·978	85·6	123·8	+ 3·1	0	5
01	27·594	−10·1	186·3	− 5·7		
20528	·882	82·9	125·2	+ 3·5	0	19

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1963		°	°	°		
01	28·407	−10·5	175·6	− 5·7		
20529	·503	300·1	201·7	+ 9·4	6	63
20528	·795	81·3	123·8	+ 3·3	2	16
01	29·295	−10·8	163·9	− 5·8		
20529	·661	291·3	202·3	+ 9·3	37	302
01	30·282	−11·2	150·9	− 5·9		
20529	·935	282·9	202·8	+ 9·8	54	521
01	31·459	−11·7	135·4	− 6·0		
20529	·811	286·6	202·7	+ 9·7	72	397
02	1·416	−12·1	122·8	− 6·1		
20530	·900	104·0	58·2	−15·1	30	148
20529	·981	280·9	200·2	+ 9·4	127	567
02	2·518	−12·6	108·3	− 6·1		
20530	·770	105·5	58·0	−15·7	76	364
20531	·993	77·2	27·0	+11·9	8	88
02	3·298	−12·9	98·0	− 6·2		
20530	·652	107·7	57·9	−16·0	67	345
20531	·973	76·5	23·3	+11·6	21	134
02	4·480	−13·4	82·5	− 6·3		
20530	·438	114·8	58·1	−16·1	56	308
20531	·895	73·3	21·5	+11·9	17	119
02	5·413	−13·7	70·2	− 6·3		
20530	·271	130·8	57·9	−16·2	51	267
20531	·779	69·3	22·3	+11·8	16	84
02 1463	·943	74·5	2·0	+12·3	0	10

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
02	6·293	−14·1	58·6	− 6·4		
20530	·171	182·9	59·1	−16·0	30	194
20531	·653	63·5	22·1	+11·8	12	51
20532	·978	78·7	342·2	+ 9·6	14	109
02	7·295	−14·5	45·4	− 6·4		
20530	·305	234·6	60·3	−16·2	27	168
20531	·482	48·9	23·7	+12·4	2	21
20532	·912	76·4	341·7	+ 9·6	23	119
02	8·292	−14·8	32·3	− 6·5		
20530	·532	249·9	63·5	−16·0	25	130
20531	·333	33·0	21·7	+ 9·8	1	11
20532	·794	72·8	342·2	+ 9·4	34	123
02	9·291	−15·2	19·1	− 6·5		
20530	·706	255·2	63·9	−15·1	11	56
20532	·647	66·5	342·3	+ 9·7	26	101
02	10·299	−15·6	5·8	− 6·6		
20530	·840	256·4	63·4	−15·0	17	62
20532	·479	56·2	342·2	+ 9·4	24	123
02	11·292	−15·9	352·8	− 6·7		
20530	·933	257·1	62·4	−14·4	5	47
01 1464	·311	290·6	9·6	− 0·1	0	4
20532	·331	32·9	342·3	+ 9·5	19	103
02	12·292	−16·3	339·6	− 6·7		
20532	·286	352·3	341·8	+ 9·7	25	105
02	13·433	−16·7	324·6	− 6·8		
20532	·400	313·1	341·7	+ 9·3	18	88
02	14·411	−17·0	311·7	− 6·8		
20532	·559	297·8	341·6	+ 9·2	17	102
02 1464	·859	98·9	252·1	−11·1	0	13
02	15·294	−17·3	300·1	− 6·8		
20532	·700	290·5	341·5	+ 9·1	36	110
02	16·396	−17·7	285·6	− 6·9		
20532	·847	285·3	341·2	+ 9·1	14	71
03 1464	·837	291·7	338·6	+13·9	0	4
04 1464	·915	79·1	220·9	+ 7·0	0	5
20533	·979	78·2	209·0	+10·0	0	36
05 1464	·981	75·7	208·8	+12·5	0	15
02	17·410	−18·0	272·2	− 6·9		
20532	·944	281·8	341·2	+ 8·7	17	83
20533	·905	75·8	209·6	+ 9·6	36	141
02	18·384	−18·4	259·4	− 7·0		
20532	·995	279·8	342·0	+ 8·9	19	122
20533	·789	72·0	210·0	+ 9·6	19	131
02	19·295	−18·7	247·4	− 7·0		
20534	·487	63·5	221·5	+ 6·2	2	13
20533	·659	65·9	209·9	+10·0	22	106
02	20·402	−19·0	232·8	− 7·0		
20534	·271	31·6	224·6	+ 6·3	1	15
20533	·472	55·0	209·8	+ 9·2	16	84
02	21·425	−19·3	219·3	− 7·1		
20534	·249	342·7	223·6	+ 6·6	1	23
20533	·323	29·7	210·0	+ 9·3	12	52

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
02	22·491	− 19·6	205·3	− 7·1		
20534	·406	304·8	224·8	+ 6·7	4	21
20533	·288	344·2	209·8	+ 8·9	10	52
20535	·308	5·8	203·5	+10·7	0	9
02	23·408	− 19·9	193·2	− 7·1		
20534	·576	292·9	225·4	+ 6·9	2	27
20533	·391	312·9	210·0	+ 8·6	7	25
20535	·357	330·5	203·5	+11·0	0	6
02	24·394	− 20·2	180·2	− 7·1		
20534	·741	286·0	225·9	+ 6·8	1	24
20533	·553	296·6	210·1	+ 8·1	4	24
20535	·496	307·4	203·8	+10·9	0	5
02	25·413	− 20·5	166·8	− 7·2		
20533	·720	288·5	210·2	+ 8·0	3	16
02	26·385	− 20·7	154·0	− 7·2		
20536	·543	64·8	124·4	+ 7·1	1	30
02	27·367	− 21·0	141·1	− 7·2		
α1464	·397	16·0	134·6	+15·2	0	5
20536	·363	49·1	125·1	+ 6·8	2	17
02	28·364	·	·	·	0	0
03	1·363	·	·	·	0	0
03	2·378	·	·	·	0	0
03	3·404	− 22·0	87·9	− 7·2		
20537	·997	77·8	4·3	+11·4	0	54
03	4·419	− 22·3	74·5	− 7·2		
20537	·951	75·3	5·0	+11·5	41	303
03	5·304	− 22·5	62·9	− 7·3		
α1464	·637	278·8	101·7	− 0·1	0	4
20537	·869	72·3	5·5	+11·5	36	259
20538	·953	75·3	352·8	+11·6	0	3
03	6·352	− 22·7	49·1	− 7·3		
20537	·740	66·7	5·2	+11·8	42	199
20538	·862	71·3	352·6	+12·1	0	13
20539	·920	77·4	344·0	+ 8·6	0	11
03	7·380	− 22·9	35·5	− 7·3		
20537	·582	57·4	5·6	+11·9	30	186
20538	·728	64·3	353·4	+13·0	0	3
20539	·801	71·9	345·1	+ 9·8	0	18
03	8·501	− 23·2	20·7	− 7·2		
20537	·412	37·5	6·0	+12·0	19	160
20538	·585	54·4	351·6	+13·6	0	4
03	9·303	− 23·3	10·2	− 7·2		
20537	·334	10·9	6·5	+11·8	23	99
03	10·578	− 23·6	353·4	− 7·2		
20537	·400	324·4	7·1	+11·9	7	42
α1465	·341	355·2	355·1	+12·6	0	7
α1465	·192	357·6	353·9	+ 3·8	0	2
20539*	·802	65·9	304·5	+14·4	2	7
03	11·302	− 23·7	343·8	− 7·2		
20537	·503	308·5	7·4	+11·6	6	34
20539*	·690	60·1	305·8	+14·4	3	21

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
03	12·431	−23·9	329·0	− 7·2		
20537	·681	296·1	7·4	+11·7	3	18
20539*	·516	45·2	306·8	+14·5	4	22
03	13·362	−24·1	316·7	− 7·2		
20537	·808	290·8	7·1	+12·1	3	22
20539*	·400	22·5	307·6	+14·5	1	11
03	14·427	−24·3	302·7	− 7·2		
20540	·821	292·1	354·0	+13·5	0	8
031465	·171	238·5	311·2	−12·2	0	15
20539*	·387	346·0	308·2	+14·8	0	4
03	15·455	−24·5	289·1	− 7·2		
20540	·938	287·8	355·8	+13·9	0	6
20539*	·455	322·8	305·6	+14·3	0	8
20541	·991	76·9	209·0	+11·9	32	232
03	16·353	−24·6	277·3	− 7·1		
20541	·948	74·5	208·3	+12·2	23	190
03	17·425	−24·8	263·1	− 7·1		
20541	·848	70·6	208·4	+12·3	36	207
03	18·572	−24·9	248·0	− 7·1		
041465	·950	285·7	317·4	+12·5	0	6
20541	·696	64·3	208·3	+12·1	40	205
03	19·508	−25·1	235·7	− 7·1		
20541	·553	55·5	208·1	+12·0	31	174
03	20·307	−25·2	225·1	− 7·0		
20541	·435	42·4	207·8	+11·9	39	190
20542	·582	50·0	197·7	+15·7	0	4
03	21·303	−25·3	212·0	− 7·0		
20543	·873	259·5	273·4	−12·6	0	17
20541	·333	12·5	207·8	+11·9	29	154
20542	·425	29·7	199·5	+14·7	0	7
03	22·406	−25·4	197·5	− 7·0		
20543	·962	258·7	272·5	−12·7	0	4
20541	·363	331·0	207·8	+11·6	31	161
20542	·356	359·7	197·6	+13·8	0	24
03	23·314	−25·5	185·5	− 6·9		
20541	·483	309·3	207·8	+11·3	31	177
03	24·374	−25·6	171·5	− 6·9		
051465	·962	252·8	246·8	−18·4	0	13
20541	·654	296·6	208·0	+11·5	31	188
03	25·514	−25·8	156·5	− 6·9		
20541	·817	289·4	208·2	+11·5	36	165
03	26·574	−25·9	142·5	− 6·8		
20541	·929	285·3	208·4	+11·4	29	194
20544	·505	259·3	172·8	−11·3	0	13
03	27·526	−25·9	130·0	− 6·8		
20541	·985	282·9	208·1	+11·4	37	176
20544	·677	260·3	172·7	−11·5	0	12
03	28·538	·	·	·	0	0

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
03	29·572	− 26·1	103·0	− 6·7		
20545	·620	91·9	64·6	− 6·3	11	91
03	30·303	− 26·1	93·3	− 6·6		
20545	·464	91·2	65·6	− 6·3	29	160
03	31·309	− 26·2	80·1	− 6·6		
20545	·238	90·2	66·3	− 6·3	24	171
04	1·337	− 26·2	66·5	− 6·5		
20545	·025	308·9	67·4	− 5·7	23	122
061465	·832	94·0	10·0	− 7·0	0	18
04	2·533	− 26·3	50·7	− 6·5		
20545	·294	272·5	67·8	− 5·4	14	105
071465	·794	69·7	1·3	+11·8	0	6
04	3·446	− 26·3	38·7	− 6·4		
20545	·492	270·5	68·1	− 5·2	14	77
04	4·333	− 26·3	27·0	− 6·4		
20545	·654	269·8	67·8	− 4·8	9	41
081465	·365	27·1	17·2	+12·6	0	7
04	5·527	− 26·4	11·2	− 6·3		
20545	·843	267·8	68·8	− 5·3	6	18
20546	·157	18·6	8·4	+ 2·2	0	16
04	6·343	− 26·4	0·4	− 6·2		
20545	·932	266·7	69·4	− 5·4	3	25
091465	·830	267·2	56·7	− 5·9	0	4
20546	·205	311·0	9·3	+ 1·5	28	153
20547	·439	36·8	344·8	+14·5	11	79
04	7·385	− 26·4	346·7	− 6·2		
20545	·992	265·4	69·5	− 5·4	7	33
20546	·420	286·6	10·3	+ 1·2	28	167
20547	·362	6·2	344·4	+14·8	27	176
04	8·331	− 26·4	334·2	− 6·1		
20546	·623	279·4	12·0	+ 1·0	18	104
20547	·416	331·6	346·0	+15·4	41	180
20548	·297	354·0	336·0	+11·0	7	34
20549	·992	107·8	250·4	−18·4	8	48
04	9·443	− 26·4	319·5	− 6·0		
20546	·820	275·0	14·1	+ 0·6	3	39
20547	·558	311·2	345·3	+16·1	14	99
20548	·437	312·6	338·6	+11·4	5	22
20549	·946	107·4	247·8	−18·3	32	154
20550	·950	98·6	247·2	− 9·9	20	186
04	10·425	− 26·3	306·6	− 6·0		
20546	·933	273·1	15·1	+ 0·7	0	10
20547	·705	300·6	345·7	+16·4	7	58
20548	·616	298·7	340·0	+12·2	1	8
20549	·844	108·0	249·0	−18·2	22	131
20550	·849	98·1	248·2	− 9·9	30	274
04	11·341	− 26·3	294·5	− 5·9		
20546	·995	271·3	18·2	+ 0·7	0	51
011466	·956	275·1	6·8	+ 3·1	0	15
20547	·803	296·7	343·0	+17·3	23	68
20551	·793	294·5	342·7	+15·3	2	24
20549	·700	110·8	251·0	−18·6	14	97
20550	·717	98·1	248·6	− 9·8	50	378
04	12·408	− 26·3	280·4	− 5·8		
20547	·921	291·4	343·9	+17·0	9	91
20551	·905	289·4	342·2	+14·7	5	58
20548	·853	286·5	336·6	+10·8	8	62

continued

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
04	12·408	*continued*				
021466	·525	262·6	312·0	− 8·8	1	12
20549	·510	118·2	252·1	−19·0	12	59
20550	·539	100·5	247·9	−10·4	66	409
04	13·338	− 26·2	268·1	− 5·8		
20551	·988	288·0	346·9	+16·8	0	41
20547	·980	289·2	343·8	+17·5	5	39
20548	·957	284·0	339·3	+11·5	7	65
20549	·344	132·0	252·5	−18·8	10	62
20550	·355	104·8	247·8	−10·5	61	352
04	14·317	− 26·2	255·2	− 5·7		
20549	·230	170·4	252·9	−18·7	10	61
20550	·160	124·5	247·5	−10·7	58	399
04	15·329	− 26·1	241·8	− 5·6		
20549	·296	218·9	253·1	−18·7	12	65
20550	·132	220·3	246·8	−11·2	52	466
04	16·526	− 26·1	226·0	− 5·5		
20549	·494	241·2	253·1	−18·6	4	20
20550	·360	251·5	246·3	−11·6	81	569
04	17·654	− 26·0	211·1	− 5·4		
20549	·684	248·8	253·2	−18·3	1	8
20550	·575	256·6	245·8	−12·0	65	523
04	18·444	− 25·9	200·7	− 5·3		
20549	·784	249·7	251·6	−19·1	0	11
20550	·712	258·3	246·0	−12·0	83	593
04	19·365	− 25·8	188·5	− 5·3		
20549	·894	252·0	251·9	−18·4	0	10
20550	·842	259·6	246·0	−11·5	70	508
04	20·332	− 25·8	175·8	− 5·2		
20549	·963	252·4	250·8	−18·4	0	4
20550	·937	260·2	245·7	−11·0	59	391
04	21·375	− 25·7	162·0	− 5·1		
20550	·991	260·1	245·0	−10·5	33	241
04	22·404	− 25·5	148·4	− 5·0		
031466	·917	286·7	212·6	+13·2	0	6
04	23·600	·	·	·	0	0
04	24·313	·	·	·	0	0
04	25·313	·	·	·	0	0
04	26·586	·	·	·	0	0
04	27·545	·	·	·	0	0
04	28·491	− 24·7	68·0	− 4·4		
20552	·995	73·1	345·7	+16·2	51	325
04	29·313	− 24·6	57·1	− 4·4		
20552	·961	71·6	345·5	+16·3	36	278
04	30·354	− 24·4	43·4	− 4·2		
041466	·474	58·6	19·2	+10·4	3	14
20552	·877	69·4	345·0	+15·7	26	322
05	1·325	− 24·3	30·5	− 4·2		
20552	·761	65·5	44·8	+15·5	42	347

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1963		°	°	°		
05	2·343	− 24·1	17·1	− 4·1		
20552	·610	57·1	345·0	+15·9	34	324
05	3·352	− 23·9	3·7	− 3·9		
20552	·455	42·7	345·1	+15·7	31	257
05	4·459	− 23·7	349·1	− 3·8		
20552	·351	11·3	345·0	+16·2	34	254
20553	·911	79·5	284·6	+ 7·9	0	8
05	5·421	− 23·5	336·4	− 3·7		
20552	·368	336·7	345·1	+16·0	23	141
20553	·766	76·6	287·8	+ 7·8	0	13
05	6·375	− 23·3	323·8	− 3·6		
20552	·490	313·6	345·4	+16·3	15	92
20554	·440	313·7	342·8	+14·2	8	22
20555	·488	321·5	342·4	+18·9	0	13
20556	·357	121·4	305·5	−14·0	14	54
20553	·620	71·5	287·4	+ 8·4	7	35
05	7·335	− 23·1	311·1	− 3·5		
20552	·632	301·5	345·1	+16·3	15	83
20554	·588	299·8	342·6	+13·9	4	19
20555	·596	308·1	340·6	+18·4	0	7
20556	·197	155·0	306·2	−13·6	33	157
1	·183	159·5	307·3	−13·3	25	113
20557	·408	64·3	289·4	+ 6·9	1	8
20553	·494	63·1	284·7	+ 9·7	0	3
05	8·329	− 22·9	297·9	− 3·4		
20552	·779	294·5	345·4	+16·5	20	99
20554	·738	291·4	342·6	+13·1	1	22
20558	·451	279·5	324·3	+ 1·2	3	17
20556	·236	220·4	306·9	−13·5	38	160
1	·248	226·5	308·5	−13·2	26	118
20557	·227	39·1	289·7	+ 6·7	0	4
05	9·327	− 22·6	284·7	− 3·3		
20552	·893	290·6	345·3	+16·7	23	104
20554	·866	287·6	342·6	+13·4	2	11
20558	·640	274·8	324·2	+ 0·5	0	7
20556	·424	244·8	307·8	−13·3	26	144
1	·441	246·2	309·1	−13·2	22	114
01 1467	·197	355·2	285·7	+ 8·0	0	3
20559	·615	101·0	247·2	− 9·4	0	4
20560	·961	96·6	210·7	− 7·3	54	242
05	10·423	− 22·4	270·2	− 3·2		
20552	·975	287·8	345·7	+16·5	16	111
20556	·626	252·4	307·9	−13·3	27	162
1	·642	253·2	309·2	−13·2	27	133
02 1467	·396	325·8	283·6	+15·9	1	11
20561	·299	320·8	281·3	+10·2	8	32
20559	·398	104·8	247·4	− 8·8	5	26
20562	·799	74·2	219·0	+10·6	2	12
20560	·857	96·8	211·4	− 7·5	31	199
05	11·370	− 22·2	257·7	− 3·1		
20556	·780	255·6	308·3	−13·0	26	149
1	·790	256·0	309·4	−13·0	20	124
20561	·451	299·3	281·1	+ 9·9	1	17
20559	·191	120·8	248·2	− 8·5	4	28
20562	·652	70·2	219·3	+10·3	4	23
20560	·722	97·6	211·7	− 7·6	35	210
05	12·083	− 22·0	248·3	− 3·0		
20556	·876	256·9	309·1	−12·8	20	84
1	·879	257·0	309·5	−12·9	20	79
20561	·579	291·8	281·2	+ 9·8	1	18
20559	·118	183·3	248·7	− 9·6	0	13
20562	·532	65·0	219·1	+10·3	2	34
20560	·605	98·4	211·3	− 7·5	39	200
05	13·374	− 21·7	231·2	− 2·9		
20556	·975	257·7	308·5	−12·7	16	87
03 1467	·474	253·1	258·5	−10·5	0	3
20562	·309	42·7	219·0	+10·3	15	83
20560	·353	105·0	211·2	− 7·9	32	214
04 1467	·454	110·5	205·6	−11·7	0	6
20563	·995	81·0	147·9	+ 8·7	24	83

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1963		°	°	°		
05	14·328	−21·4	218·6	− 2·8		
20562	·228	359·1	218·8	+10·4	13	100
20560	·146	127·2	211·9	− 7·8	38	233
20563	·949	80·0	147·9	+ 8·6	65	466
1	·941	79·9	149·4	+ 8·5	42	298
05	15·324	−21·1	205·4	− 2·6		
20562	·323	314·3	218·9	+10·4	23	123
20560	·148	231·3	212·1	− 7·9	40	201
20564	·315	25·5	197·4	+13·8	0	6
20563	·860	78·5	147·2	+ 8·4	74	735
1	·842	78·5	149·1	+ 8·2	42	445
05	16·333	−20·9	192·1	− 2·5		
20562	·506	296·1	219·5	+10·6	37	236
20560	·351	254·2	211·9	− 7·9	41	199
20564	·290	344·7	196·6	+13·6	0	14
20563	·727	75·5	146·8	+ 8·7	101	880
1	·700	75·3	149·1	+ 8·4	51	446
05	17·469	−20·5	177·1	− 2·4		
20562	·710	286·9	220·5	+10·1	36	115
20560	·579	259·9	212·1	− 7·8	35	157
20564	·429	310·0	196·7	+13·7	1	15
20563	·522	69·5	147·6	+ 8·4	79	646
1	·494	68·7	149·5	+ 8·1	54	387
05	18·323	−20·3	165·8	− 2·3		
20562	·852	283·2	222·9	+ 9·9	9	113
20560	·728	261·3	212·1	− 7·9	28	195
20564	·590	297·2	198·3	+13·6	5	44
051467	·187	56·6	156·8	+ 3·6	0	8
20563	·357	59·1	147·8	+ 8·3	127	644
1	·323	56·5	150·1	+ 8·0	95	389
05	19·323	−20·0	152·5	− 2·2		
20562	·958	281·2	225·0	+10·0	9	43
20560	·867	262·2	212·4	− 7·9	25	160
20564	·764	290·3	199·9	+13·8	41	214
20563	·198	21·2	148·4	+ 8·4	97	531
1	·185	13·0	150·1	+ 8·1	77	410

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1963		°	°	°		
05	20·356	−19·7	138·9	− 2·1		
20562	·997	280·7	223·6	+10·5	0	24
20560	·960	262·3	212·5	− 8·0	19	192
20564	·890	286·6	200·1	+13·7	45	254
20563	·255	314·7	49·4	+ 8·2	80	469
1	·265	311·6	150·4	+ 8·0	68	412
05	21·575	−19·3	122·7	− 1·9		
20564	·984	284·9	201·3	+14·2	20	186
20565	·647	278·5	162·5	+ 4·0	0	7
20563	·473	291·1	149·1	+ 8·0	75	407
1	·481	290·4	149·7	+ 7·9	71	374
05	22·366	−19·1	112·3	− 1·8		
20564	·996	284·3	196·1	+14·0	0	57
20565	·764	276·3	161·6	+ 3·6	0	2
20563	·627	285·5	149·8	+ 8·2	80	446
1	·632	285·3	150·1	+ 8·1	77	424
20566	·985	79·3	33·0	+10·2	0	20
05	23·366	−18·7	99·0	− 1·7		
20565	·920	274·9	165·6	+ 3·8	23	129
20563	·786	281·3	150·0	+ 7·8	86	539
1	·786	281·3	150·0	+ 7·8	86	539
20566	·930	78·2	31·6	+10·3	2	42
20567	·958	76·5	26·8	+12·4	3	46
05	24·316	−18·4	86·5	− 1·6		
20565	·985	274·3	166·1	+ 3·9	62	460
20563	·902	279·6	150·2	+ 7·9	90	543
1	·902	279·6	150·2	+ 7·9	90	543
20568	·830	77·0	31·5	+ 9·8	2	21
20566	·872	74·6	27·2	+12·5	2	9
05	25·349	−18·1	72·8	− 1·5		
20563	·980	278·3	150·6	+ 7·8	100	552
1	·980	278·3	150·6	+ 7·8	100	552
20568	·649	72·7	34·0	+ 9·9	0	10
20566	·735	71·5	27·5	+12·4	1	10
20567	·754	68·1	26·5	+15·3	0	8

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
05	26·360	− 17·7	59·4	− 1·4		
20568	·432	69·7	35·4	+ 7·3	0	3
20566	·562	65·9	27·9	+12·0	1	7
05	27·357	− 17·4	46·2	− 1·3		
20568	·284	49·2	33·7	+ 9·4	1	17
20569	·755	71·6	359·1	+12·9	2	23
20570	·970	85·3	330·7	+ 4·2	0	14
05	28·641	− 17·0	29·3	− 1·1		
20569	·546	63·6	359·3	+13·1	16	83
20570	·822	84·7	334·4	+ 3·8	4	22
05	29·333	− 16·7	20·1	− 1·0		
20569	·426	55·1	359·2	+13·1	17	89
20570	·719	83·9	334·6	+ 3·7	1	11
061467	·941	104·1	310·5	−13·6	0	6
05	30·382	− 16·3	6·2	− 0·9		
20571	·495	294·0	33·5	+10·8	11	57
20569	·273	25·6	359·3	+13·3	17	111
20570	·529	81·6	334·7	+ 3·6	1	7
05	31·329	− 16·0	353·7	− 0·8		
20571	·665	287·0	33·9	+10·6	32	233
20569	·267	339·2	359·2	+13·6	11	69
06	1·358	− 15·6	340·1	− 0·7		
20571	·827	283·7	34·7	+10·9	41	231
20569	·408	307·4	359·4	+13·6	4	46
06	2·360	− 15·2	326·8	− 0·5		
20571	·942	282·2	36·4	+11·3	30	210
011468	·935	261·6	35·7	− 8·0	0	3
20569	·607	295·6	1·2	+14·7	3	20
06	3·347	− 14·9	313·7	− 0·4		
20571	·989	281·0	34·8	+10·8	0	7
20569	·783	290·5	3·1	+15·6	2	13
06	4·382	− 14·5	300·1	− 0·3		
20572	·265	52·7	287·8	+ 8·9	0	8
20573	·906	104·1	236·0	−12·8	0	2
20569	·900	287·7	2·9	+15·7	2	8
06	5·323	− 14·1	287·6	− 0·2		
20572	·172	355·3	288·4	+ 9·7	1	12
20573	·778	106·4	237·8	−12·8	0	11
20574	·961	99·5	214·0	− 9·2	13	70
06	6·308	− 13·7	274·6	0·0		
20574	·872	100·5	214·5	− 9·2	16	65
06	7·328	− 13·3	261·1	+ 0·1		
20573	·460	118·0	236·6	−12·3	12	59
20574	·738	102·7	214·5	− 9·3	12	64
20575	·930	73·2	193·7	+15·6	0	7
06	8·356	− 12·9	247·5	+ 0·2		
20573	·286	139·2	236·5	−12·1	4	69
20574	·559	107·1	214·8	− 9·3	8	42
20575	·781	73·1	197·5	+13·2	5	70
20576	·974	87·5	170·8	+ 2·5	15	80
06	9·378	− 12·5	233·9	+ 0·3		
20573	·224	201·5	238·7	−11·5	12	65
20574	·368	116·7	214·6	− 9·2	5	24
20575	·612	69·4	198·1	+12·6	43	276
20576	·894	86·9	170·9	+ 2·9	25	94
20577	·992	81·8	151·3	+ 8·2	91	327

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
06	10·327	− 12·1	221·4	+ 0·4		
20573	·360	235·4	238·9	−11·2	6	45
20574	·202	144·7	214·6	− 9·0	1	9
20575	·445	61·2	197·9	+12·7	94	515
20576	·769	86·3	171·4	+ 3·1	19	82
20577	·946	81·3	150·7	+ 8·4	38	256
06	11·293	− 11·7	208·6	+ 0·6		
20573	·560	248·5	240·5	−11·3	1	10
20575	·261	37·5	199·3	+12·4	99	727
20576	·594	85·9	172·3	+ 2·9	7	32
20577	·846	80·4	151·3	+ 8·4	36	265
06	12·432	− 11·2	193·5	+ 0·7		
20573	·751	253·3	240·7	−12·0	0	4
20575	·231	332·8	199·7	+12·4	187	927
20576	·364	84·8	172·3	+ 2·5	3	21
20577	·682	79·2	151·1	+ 7·8	24	179
021468	·913	90·0	127·9	+ 0·3	0	2
06	13·600	− 10·7	178·0	+ 0·8		
20575	·436	298·6	201·0	+12·7	142	843
20576	·098	75·6	172·6	+ 2·2	1	8
20577	·457	74·4	151·8	+ 7·8	27	173
06	14·341	− 10·4	168·2	+ 0·9		
031468	·834	283·9	223·8	+12·1	0	20
20575	·578	291·0	201·7	+12·7	104	794
20577	·315	67·3	151·3	+ 7·8	28	165
06	15·345	− 10·0	154·9	+ 1·0		
20575	·751	286·4	202·4	+12·9	105	710
20577	·129	26·0	151·7	+ 7·6	29	145
06	16·406	− 9·5	140·9	+ 1·2		
20575	·897	283·7	204·0	+12·8	85	587
20577	·219	303·4	151·5	+ 8·0	20	137
06	17·335	− 9·1	128·6	+ 1·3		
20575	·971	282·9	204·5	+12·8	74	426
20577	·405	286·3	151·6	+ 7·7	15	76
06	18·367	− 8·7	114·9	+ 1·4		
20575	·996	282·9	199·5	+12·9	0	46
041468	·905	281·0	179·3	+10·5	0	4
20577	·604	280·9	151·5	+ 7·6	16	65
20578	·950	76·9	43·5	+12·9	3	37
06	19·513	− 8·2	99·8	+ 1·5		
20577	·790	278·9	151·6	+ 8·0	11	54
20578	·857	74·0	41·7	+14·5	0	2
06	20·106	− 7·9	91·9	+ 1·6		
20577	·872	279·2	152·2	+ 8·8	21	71
06	21·438	− 7·3	74·3	+ 1·8		
20577	·980	277·8	152·6	+ 8·0	0	44
20578	·516	67·7	45·1	+12·8	0	15
06	22·432	− 6·9	61·1	+ 1·9		
20578	·304	52·3	47·0	+12·5	1	11
06	23·347	− 6·5	49·0	+ 2·0		
20579	·511	281·3	79·3	+ 7·4	0	7
20578	·187	9·9	47·2	+12·6	0	11
06	24·566	− 5·9	32·9	+ 2·1		
20579	·726	278·5	79·1	+ 7·6	15	115
20578	·263	303·8	45·7	+10·4	0	8

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
06	25·642	5·5	18·6	+ 2·3		
20579	·881	277·5	80·2	+ 7·6	5	37
20580	·575	76·9	344·2	+ 9·3	30	124
20581	·984	76·0	299·0	+14·2	14	106
06	26·418	− 5·1	8·4	+ 2·3		
20579	·957	276·9	81·4	+ 7·3	0	8
20578	·653	286·7	48·1	+12·6	0	12
20580	·428	73·7	343·9	+ 9·0	33	166
20581	·939	75·9	298·9	+14·0	13	63
06	27·313	− 4·7	356·5	+ 2·4		
20578	·801	284·1	49·1	+12·7	0	12
20580	·237	61·9	344·3	+ 8·7	24	110
20581	·837	74·9	300·4	+13·9	11	55
06	28·599	− 4·1	339·5	+ 2·6		
20578	·946	283·5	50·4	+13·6	0	11
20582	·815	281·1	33·7	+10·5	0	12
20580	·144	317·2	345·1	+ 8·6	12	57
20581	·641	70·7	301·0	+14·2	9	44
06	29·473	− 3·7	327·9	+ 2·7		
20578	·989	282·5	49·6	+12·8	0	7
20582	·904	281·2	32·5	−11·3	0	27
20580	·340	286·6	347·0	+ 8·1	10	34
20581	·485	64·1	301·3	−14·6	3	30
06	30·137	− 3·4	319·1	+ 2·8		
20582	·950	280·4	31·0	+10·7	0	17
20580	·484	281·8	347·6	+ 8·1	0	14
20581	·341	54·3	302·6	+14·1	0	6
07	1·337	− 2·9	303·3	+ 2·9		
20580	·743	277·3	351·1	+ 7·3	1	16
20583	·565	277·9	337·4	+ 6·8	1	11
20581	·186	358·3	303·6	+13·5	1	21
20584	·237	37·8	294·7	+13·6	0	5
07	2·308	− 2·4	290·4	+ 3·0		
20580	·875	277·0	351·4	+ 7·6	2	16
20585	·789	281·0	342·2	+10·5	0	4
20583	·725	276·7	336·7	+ 6·9	0	7
20581	·280	313·5	302·4	+14·0	0	5
07	3·366	− 2·0	276·4	+ 3·1		
20580	·972	277·7	352·9	+ 8·2	0	10
20585	·917	279·7	342·8	+10·2	28	153
20581	·468	295·0	302·2	+14·1	0	7
20584	·362	301·0	295·0	+13·6	0	5
20586	·966	78·1	201·4	+12·3	40	193
07	4·333	− 1·5	263·6	+ 3·2		
20585	·986	278·3	344·2	+ 8·7	21	191
20586	·887	76·9	201·3	+13·1	27	179
07	5·399	− 1·0	249·5	+ 3·3		
20586	·755	76·7	200·9	+12·2	30	170
07	6·403	− 0·6	236·2	+ 3·4		
20586	·597	73·6	200·5	+12·5	40	228
07	7·402	− 0·1	223·0	+ 3·5		
20586	·407	67·8	200·4	+12·1	37	160
07	8·326	+ 0·3	210·8	+ 3·6		
20586	·235	50·5	200·1	+12·1	37	173
07	9·394	+ 0·8	196·6	+ 3·8		
20586	·158	339·8	199·8	+12·2	28	154
011469	·257	86·6	181·8	+ 4·5	1	7

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
07	10·533	+ 1·3	181·5	+ 3·9		
20586	·338	295·9	199·6	+12·1	27	165
07	11·329	+ 1·7	171·0	+ 4·0		
20586	·495	288·1	199·7	+12·3	22	170
07	12·553	+ 2·2	154·8	+ 4·1		
20586	·707	283·4	199·4	+12·3	30	171
07	13·356	+ 2·6	144·2	+ 4·2		
20586	·821	282·2	199·2	+12·4	30	169
20587	·124	119·4	138·1	+ 0·7	1	20
07	14·380	+ 3·0	130·6	+ 4·3		
20586	·929	281·6	199·0	+12·3	31	176
20587	·171	250·0	139·8	+ 0·9	10	44
07	15·627	+ 3·6	114·1	+ 4·4		
20586	·992	282·0	197·6	+12·4	20	165
20587	·436	264·7	139·8	+ 1·7	3	28
07	16·334	+ 3·9	104·8	+ 4·4		
20587	·592	268·0	140·9	+ 2·4	1	19
07	17·334	+ 4·4	91·6	+ 4·5		
20587	·766	270·5	141·5	+ 3·3	9	37
07	18·339	+ 4·8	78·3	+ 4·6		
20587	·906	272·5	143·1	+ 4·2	8	32
07	19·338	+ 5·2	65·0	+ 4·7		
20587	·985	273·5	145·1	+ 4·2	0	20
20588	·942	81·0	354·4	+10·1	3	37
07	20·425	+ 5·7	50·6	+ 4·8		
20589	·127	22·7	47·8	+11·5	0	6
20588	·854	80·5	351·9	+10·6	2	62
07	21·319	+ 6·1	38·8	+ 4·9		
20589	·273	286·5	54·1	+ 9·2	4	19
20588	·713	80·6	353·4	+10·1	1	31
07	22·376	+ 6·6	24·8	+ 5·0		
20589	·504	279·9	54·9	+ 9·3	0	13
20588	·500	78·7	355·1	+10·0	7	31
07	23·325	+ 7·0	12·3	+ 5·1		
α21469	·464	259·5	39·3	− 0·3	0	4
α31469	·383	143·3	358·8	−12·8	0	6
20588	·309	73·5	354·9	+ 9·9	6	45
07	24·580	+ 7·5	355·7	+ 5·2		
20588	·075	63·0	355·2	+ 9·4	12	93
07	25·348	+ 7·8	345·5	+ 5·3		
20589	·929	277·7	54·1	+ 9·1	3	21
20588	·180	297·2	354·8	+ 9·9	6	53
07	26·327	+ 8·2	332·6	+ 5·3		
20588	·416	281·4	356·9	+ 9·5	0	22

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1963		°	°	°		
07	27·327	+ 8·6	319·3	+ 5·4		
20588	·561	281·1	353·2	+10·7	0	22
20590	·540	265·6	351·8	+ 2·2	1	19
011470	·863	89·0	259·7	+ 3·6	0	5
07	28·361	+ 9·1	305·7	+ 5·5		
20590	·753	268·5	354·4	+ 2·5	0	7
07	29·324	+ 9·5	292·9	+ 5·6		
20591	·267	298·9	306·7	+12·8	0	7
20592	·959	80·3	218·9	+10·8	21	64
07	30·339	+ 9·9	279·5	+ 5·6		
20591	·447	287·7	305·3	+12·9	23	122
20592	·876	80·3	218·1	+11·2	29	181
1	·870	80·1	218·8	+11·4	23	135
20593	·984	79·4	199·2	+11·4	5	33
07	31·319	+10·3	266·5	+ 5·7		
20591	·622	283·6	304·7	+12·9	38	197
20592	·750	80·0	217·9	+11·3	74	433
1	·741	79·3	218·7	+11·7	56	325
20593	·904	80·7	201·5	+10·8	14	53
20594	·939	78·9	196·2	+12·4	13	69
08	1·332	+10·7	253·1	+ 5·8		
20591	·801	281·5	306·5	+12·7	44	189
20592	·573	78·5	218·4	+11·3	74	416
1	·564	77·9	219·0	+11·6	64	343
20593	·775	81·3	202·2	+10·4	7	38
20594	·831	78·6	196·8	+12·7	16	74
08	2·350	+11·1	239·7	+ 5·9		
20591	·927	280·9	308·1	+12·3	30	134
20592	·371	73·7	218·5	+11·4	60	348
1	·364	73·1	219·0	+11·5	46	286
20593	·595	80·9	203·2	+10·1	7	40
20594	·680	77·5	196·9	+12·8	16	47

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1963		°	°	°		
08	3·326	+11·5	226·8	+ 5·9		
20591	·988	281·3	308·7	+12·0	19	139
20592	·175	56·7	218·3	+11·3	50	320
1	·170	55·5	218·6	+11·4	48	285
20593	·396	78·6	203·7	+ 9·9	16	116
20594	·503	74·3	197·1	+12·9	6	29
08	4·320	+11·9	213·6	+ 6·0		
20592	·125	321·6	218·1	+11·5	52	327
1	·127	320·8	218·3	+11·6	51	298
20593	·193	68·1	203·2	+10·0	32	270
20594	·315	65·5	196·6	+13·2	0	21
08	5·317	+12·3	200·4	+ 6·1		
20592	·316	287·7	218·2	+11·3	55	294
1	·320	288·0	218·4	+11·4	51	263
20593	·087	320·9	203·6	+ 9·8	55	282
20594	·140	27·9	196·6	+13·1	1	11
08	6·340	+12·6	186·9	+ 6·1		
20592	·520	281·9	218·1	+11·4	58	299
1	·523	281·7	218·3	+11·3	57	275
20593	·281	283·2	203·0	+ 9·6	55	274
20594	·209	310·1	196·3	+13·7	1	13
20595	·499	86·0	156·9	+ 7·3	1	7
08	7·335	+13·0	173·8	+ 6·2		
20592	·704	279·4	218·6	+11·0	52	270
1	·704	279·4	218·6	+11·0	52	270
20593	·504	278·8	204·0	+ 9·8	40	201
20594	·411	287·4	197·4	+12·7	0	10
20595	·269	85·2	158·1	+ 7·3	0	7
08	8·365	+13·4	160·1	+ 6·3		
20592	·850	278·9	218·7	+10·8	43	240
1	·850	278·9	218·7	+10·8	43	240
20593	·693	278·0	204·2	+10·0	40	199

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
08	9·350	+13·8	147·1	+ 6·3		
20592	·949	279·4	219·4	+10·9	47	294
1	·949	279·4	219·4	+10·9	47	294
20593	·840	277·4	204·5	+ 9·7	38	200
08	10·516	+14·2	131·7	+ 6·4		
20593	·953	277·8	204·6	+ 9·4	39	204
08	11·370	+14·5	120·4	+ 6·4		
20593	·995	278·9	205·2	+ 9·5	55	254
08	12·326	+14·9	107·8	+ 6·5		
20596	·996	102·8	24·9	−12·0	0	10
08	13·330	+15·2	94·5	+ 6·6		
20596	·948	105·1	25·3	−12·0	0	8
08	14·319	+15·6	81·4	+ 6·6		
021470	·397	78·4	58·2	+10·6	3	15
20596	·833	109·4	28·1	−12·2	0	2
08	15·327	+15·9	68·1	+ 6·7		
20596	·696	114·3	27·9	−11·5	2	27
08	16·174	+16·2	56·9	+ 6·7		
20596	·545	122·7	29·1	−11·1	1	32
08	17·322	+16·6	41·7	+ 6·7		
20596	·368	147·5	30·2	−11·3	27	218
08	18·395	+16·9	27·5	+ 6·8		
20596	·322	192·3	31·5	−11·4	40	174
031470	·542	119·7	359·1	− 9·5	0	9
20597	·989	100·3	307·6	− 8·9	32	184
08	19·317	+17·2	15·4	+ 6·8		
20596	·436	223·5	33·1	−11·8	33	173
20597	·958	101·5	303·8	− 8·8	33	233
08	20·405	+17·6	1·0	+ 6·9		
20596	·607	240·7	33·5	−11·4	26	158
20598	·028	326·4	1·9	+ 8·2	3	15
20597	·862	104·4	303·5	− 8·6	14	86
08	21·547	+17·9	345·9	+ 6·9		
20596	·786	249·4	34·4	−11·4	32	157
20598	·300	273·6	3·4	+ 7·7	17	57
20599	·338	226·8	0·2	− 6·5	5	29
20597	·703	109·8	304·0	− 8·5	1	18
08	22·605	+18·3	331·9	+ 7·0		
20596	·905	254·3	34·3	−10·9	27	97
20598	·531	273·0	4·1	+ 7·5	21	116
20599	·527	246·4	0·8	− 6·0	31	145
20600	·508	238·1	357·7	− 9·2	1	9
011471	·409	232·9	351·0	− 7·7	0	4
20597	·500	118·1	305·6	− 7·4	0	3
08	23·624	+18·6	318·4	+ 7·0		
20596	·976	256·6	33·9	−11·4	11	84
20598	·726	273·7	5·2	+ 7·5	43	197
20599	·709	254·4	1·6	− 5·8	58	229
20600	·683	250·0	358·7	− 8·2	0	16
20597	·353	138·4	304·8	− 8·3	0	17
08	24·452	+18·8	307·5	+ 7·0		
20596	·992	257·4	28·6	−11·5	0	28
20598	·866	273·9	7·8	+ 6·9	40	296
20599	·840	258·9	3·2	− 5·3	47	263
20597	·272	185·8	309·1	− 8·6	0	4

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
08	25·344	+ 19·1	295·7	+ 7·0		
20598	·957	274·6	9·2	+ 6·4	48	288
20599	·933	261·6	3·4	− 5·1	14	120
20601	·969	80·8	219·2	+10·6	8	40
08	26·314	+ 19·4	282·9	+ 7·1		
20599	·995	262·5	5·8	− 6·6	0	9
20598	·984	276·8	3·2	+ 8·0	0	49
20601	·887	81·9	219·9	+10·4	2	19
20602	·969	82·4	206·6	+ 9·1	28	105
08	27·319	+ 19·7	269·6	+ 7·1		
20601	·767	82·3	219·2	+10·4	2	12
20602	·889	83·5	206·5	+ 9·0	19	138
08	28·490	+ 20·0	254·1	+ 7·1		
20602	·729	84·6	207·1	+ 8·8	23	132
20603	·937	79·7	183·9	+12·1	0	10
08	29·338	+ 20·2	242·9	+ 7·1		
20602	·581	84·2	207·3	+ 9·2	23	122
021471	·768	79·2	192·4	+12·9	2	7
20603	·847	80·6	184·6	+11·8	0	5
08	30·128	+ 20·5	232·5	+ 7·2		
20602	·422	83·2	207·5	+ 9·4	19	99
08	31·320	+ 20·8	216·8	+ 7·2		
20601	·110	320·1	220·9	+12·0	0	15
20602	·165	79·0	207·4	+ 8·9	16	118
20604	·793	89·7	164·3	+ 4·6	6	16
021471	·829	91·9	161·0	+ 2·4	0	12
09	1·395	+ 21·0	202·6	+ 7·2		
20601	·316	285·7	220·6	+11·7	0	6
20602	·091	289·8	207·4	+ 8·9	20	78
20604	·595	91·5	166·1	+ 4·9	1	9
09	2·461	+ 21·3	188·5	+ 7·2		
041471	·631	245·0	223·8	− 9·6	1	12
20602	·323	276·4	207·4	+ 8·9	21	88
20604	·389	96·0	165·8	+ 4·3	1	5
09	3·328	+ 21·5	177·0	+ 7·2		
20602	·514	274·8	208·1	+ 8·6	10	58
051471	·441	282·5	203·0	+12·0	0	4
20605	·195	69·0	166·4	+11·1	0	4
20604	·206	104·2	165·5	+ 4·2	4	19
09	4·395	+ 21·8	162·9	+ 7·2		
20602	·707	275·0	208·2	+ 8·7	5	23
20606	·523	282·5	194·3	+12·7	4	23
20605	·101	317·8	166·8	+11·4	2	29
20604	·077	225·1	166·0	+ 4·2	14	81
09	5·541	+ 22·1	147·8	+ 7·2		
20602	·866	275·8	208·2	+ 8·6	5	16
20606	·747	279·6	196·4	+11·9	1	5
20604	·353	262·0	168·2	+ 4·0	22	125
20605	·313	285·7	165·6	+11·7	0	21
061471	·434	72·0	122·7	+14·3	0	3
09	6·430	+ 22·3	136·1	+ 7·2		
20602	·950	276·8	208·4	+ 8·7	0	17
20604	·549	265·3	169·1	+ 3·5	16	94
20605	·479	281·1	164·6	+11·6	0	4
09	7·296	+ 22·5	124·6	+ 7·3		
20604	·738	267·4	172·0	+ 3·0	13	69
09	8·317	+ 22·7	111·1	+ 7·3		
20604	·886	269·8	173·5	+ 3·2	14	80

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
09	9·320	+22·9	97·9	+ 7·3		
20604	·972	272·2	174·5	+ 3·9	10	48
20607	·983	85·9	18·2	+ 5·4	13	103
09	10·370	+23·1	84·0	+ 7·3		
20607	·916	87·5	17·6	+ 5·2	11	90
20608	·933	99·0	16·5	− 5·7	3	19
20609	·983	99·3	6·1	− 7·7	5	53
09	11·583	+23·4	68·0	+ 7·2		
20607	·764	89·1	18·1	+ 5·4	15	79
20608	·793	103·1	17·3	− 5·7	4	20
20609	·879	103·1	8·4	− 7·7	0	19
09	12·322	+23·5	58·3	+ 7·2		
20607	·641	90·1	18·3	+ 5·5	13	84
20608	·679	107·1	17·7	− 6·0	1	11
20609	·838	106·0	3·8	− 9·1	11	54
09	13·325	+23·7	45·0	+ 7·2		
20608	·493	115·5	18·6	− 5·8	1	8
20607	·446	91·9	18·5	+ 5·6	15	62
20609	·699	110·8	3·8	− 8·8	82	383
09	14·315	+23·9	31·9	+ 7·2		
20608	·315	134·6	19·0	− 5·7	0	7
20607	·231	95·3	18·6	+ 5·8	9	41
20609	·520	121·5	5·3	− 9·2	85	399
20610	·987	77·7	310·1	+13·2	88	964
09	15·362	+24·1	18·1	+ 7·2		
20607	·029	201·2	18·7	+ 5·7	3	15
20608	·224	181·2	18·4	− 5·7	0	10
20609	·351	145·7	6·6	− 9·6	83	407
20610	·927	78·8	309·4	+13·1	132	1194
09	16·323	+24·2	5·4	+ 7·2		
20608	·329	226·2	19·2	− 6·1	0	1
20607	·233	264·2	18·8	+ 5·7	6	25
20609	·303	187·1	7·6	−10·1	64	338
1	·331	198·1	11·4	−11·1	28	161
20610	·815	79·2	310·5	+13·0	166	1168
09	17·548	+24·4	349·3	+ 7·2		
20607	·490	270·1	18·6	+ 6·3	1	12
20609	·468	230·2	10·6	−10·6	57	273
1	·493	231·5	12·3	−11·2	44	193
20610	·631	78·0	310·1	+13·1	239	1291
09	18·354	+24·6	338·6	+ 7·2		
20607	·646	271·1	19·0	+ 6·2	0	8
20609	·624	242·3	12·7	−10·8	42	214
1	·628	242·4	13·0	−11·0	42	199
20610	·475	76·0	310·5	+12·9	193	1154
09	19·539	+24·7	323·0	+ 7·1		
a11472	·800	276·0	16·5	+ 9·0	0	8
20609	·807	250·7	13·7	−10·9	33	202
1	·812	250·7	14·1	−11·1	31	186
20610	·237	63·6	310·5	+13·0	180	1208
09	20·375	+24·9	311·9	+ 7·1		
20609	·907	254·2	14·6	−11·0	46	184
1	·912	254·3	15·2	−11·2	39	160
20610	·110	10·9	310·7	+13·2	226	1308
09	21·355	+25·0	299·0	+ 7·1		
20609	·979	256·5	15·3	−11·5	27	192
1	·981	256·4	15·7	−11·8	23	172
20610	·226	296·8	310·9	+12·7	218	1311
09	22·205	+25·1	287·8	+ 7·1		
20610	·407	285·9	311·3	+12·8	195	1187

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
09	23·581	+ 25·3	269·6	+ 7·0		
20610	·668	281·3	311·6	+12·7	145	999
09	24·438	+ 25·4	258·3	+ 7·0		
20610	·803	281·0	312·1	+13·0	145	1000
09	25·336	+ 25·5	246·5	+ 7·0		
20610	·909	280·7	312·4	+12·6	91	803
02 1472	·470	164·1	238·6	−19·8	2	15
09	26·327	+ 25·6	233·4	+ 6·9		
20610	·978	281·2	312·3	+12·4	117	806
09	27·357	·	·	·	0	0
09	28·342	+ 25·8	206·8	+ 6·9		
02 1472	·881	275·6	269·0	+ 8·2	2	31
09	29·290	·	·	·	0	0
09	30·332	·	·	·	0	0
10	1·401	·	·	·	0	0
10	2·342	·	·	·	0	0
10	3·323	+ 26·1	141·1	+ 6·6		
20611	·714	279·3	186·8	+11·2	1	26
10	4·338	+ 26·2	127·7	+ 6·6		
20611	·876	279·0	189·2	+11·0	0	2
10	5·419	·	·	·	0	0
10	6·447	+ 26·3	99·8	+ 6·4		
20612	·963	83·6	25·0	+ 7·9	38	294
1	·958	83·9	26·1	+ 7·6	33	231
10	7·476	+ 26·3	86·3	+ 6·4		
20613	·887	54·0	25·8	+34·6	0	12
20612	·877	84·6	24·7	+ 7·8	59	345
1	·861	85·2	26·6	+ 7·4	37	242
10	8·306	+ 26·3	75·3	+ 6·3		
20613	·789	49·7	28·2	+35·0	18	62
1	·782	49·2	29·1	+35·2	15	46
20612	·768	85·1	25·0	+ 7·8	55	313
1	·749	85·5	26·7	+ 7·6	36	196
10	9·345	+ 26·3	61·6	+ 6·3		
20613	·674	42·8	27·9	+34·8	41	197
1	·661	41·8	29·3	+34·8	22	129
20612	·582	85·4	25·9	+ 7·8	40	245
1	·564	85·9	27·2	+ 7·5	33	179
10	10·344	+ 26·4	48·4	+ 6·2		
20613	·563	32·0	27·3	+34·2	47	179
1	·551	30·3	28·9	+34·2	32	126
20612	·371	85·7	26·6	+ 7·4	30	201
1	·363	86·1	27·1	+ 7·2	29	180
10	11·382	+ 26·4	34·7	+ 6·1		
20613	·484	12·3	27·6	+34·2	33	156
1	·481	10·7	28·6	+34·2	23	125
20612	·140	78·9	26·8	+ 7·6	35	175
1	·140	78·9	26·8	+ 7·6	35	175
20614	·982	77·5	314·7	+13·4	0	16
20615	·995	67·0	308·8	+23·5	10	141

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
10	12·420	+ 26·3	21·0	+ 6·1		
20613	·480	348·9	27·4	+34·0	16	96
1	·481	347·9	28·0	+33·9	15	85
20612	·104	285·5	26·8	+ 7·6	32	147
1	·104	285·5	26·8	+ 7·6	32	147
20614	·911	78·1	314·9	+13·4	0	11
20615	·947	67·1	309·1	+23·6	25	103
10	13·351	+ 26·3	8·8	+ 6·0		
20613	·548	331·2	27·4	+34·3	20	116
1	·550	330·7	27·7	+34·3	20	108
20612	·308	277·8	26·6	+ 8·1	30	159
1	·308	277·8	26·6	+ 8·1	30	159
20614	·808	77·5	314·7	+13·6	0	9
20615	·872	65·9	308·5	+23·9	16	79
10	14·341	+ 26·3	355·7	+ 5·9		
20613	·648	318·6	26·8	+34·1	13	76
1	·648	318·6	26·8	+34·1	13	76
20612	·512	276·0	26·5	+ 8·2	24	145
1	·512	276·0	26·5	+ 8·2	24	145
20616	·100	118·6	350·7	+ 3·2	8	38
011473	·534	76·9	323·7	+12·0	0	4
20615	·756	63·3	308·3	+23·9	12	48
10	15·402	+ 26·3	341·7	+ 5·9		
20612	·707	275·9	26·8	+ 8·3	25	132
1	·707	275·9	26·8	+ 8·3	25	132
20613	·763	310·7	25·8	+34·1	15	76
1	·763	310·7	25·8	+34·1	15	76
20616	·195	254·0	352·4	+ 2·7	30	152
20615	·607	57·3	307·9	+24·0	1	11
10	16·304	+ 26·2	329·8	+ 5·8		
20612	·836	276·0	26·7	+ 8·2	24	169
1	·836	276·0	26·7	+ 8·2	24	169
20613	·852	306·8	25·1	+34·0	16	57
1	·852	306·8	25·1	+34·0	16	57
20616	·376	263·4	351·7	+ 2·9	60	267
10	17·426	+ 26·2	315·0	+ 5·7		
20612	·951	277·2	27·4	+ 8·6	29	146
1	·951	277·2	27·4	+ 8·6	29	146
20613	·941	304·4	24·6	+34·2	6	45
1	·941	304·4	24·6	+34·2	6	45
20616	·622	268·2	353·4	+ 3·4	37	265
021473	·192	164·5	312·1	− 5·0	0	14
10	18·478	+ 26·1	301·1	+ 5·6		
20613	·986	303·5	23·1	+33·9	12	79
1	·986	303·5	23·1	+33·9	12	79
20616	·792	269·9	353·4	+ 3·3	35	197
20617	·244	299·9	313·6	+12·4	0	19
10	19·340	+ 26·1	289·8	+ 5·6		
20616	·892	271·3	352·9	+ 3·7	26	108
20617	·459	294·1	315·4	+15·7	0	12
10	20·277	+ 26·0	277·4	+ 5·5		
20616	·969	272·8	353·1	+ 4·1	8	52
20618	·977	78·4	199·0	+12·5	156	739
1	·966	77·8	201·9	+13·2	85	407
10	21·348	+ 26·0	263·3	+ 5·4		
20618	·902	79·2	198·6	+12·0	179	877
1	·870	78·4	202·6	+12·8	94	440
10	22·393	+ 25·9	249·5	+ 5·3		
20618	·774	79·0	198·8	+11·9	148	949
1	·717	77·7	203·9	+12·4	71	406
10	23·479	+ 25·8	235·2	+ 5·2		
20618	·598	77·4	198·8	+11·7	169	969
1	·521	75·6	204·3	+11·9	80	397

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U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
10	24·302	+ 25·7	224·3	+ 5·1		
20619	·625	244·9	259·4	−11·1	0	4
20618	·417	72·6	200·4	+11·8	130	776
1	·353	69·5	204·7	+11·9	91	409
10	25·306	+ 25·6	211·1	+ 5·0		
20619	·787	253·0	260·8	−10·0	5	23
20618	·210	55·5	201·0	+11·8	120	703
1	·158	41·7	205·0	+11·7	60	380
10	26·549	+ 25·4	194·7	+ 4·9		
20619	·924	256·5	260·5	−10·3	15	78
20618	·169	313·6	201·8	+11·5	81	526
1	·219	296·6	206·1	+10·4	7	66
10	27·595	+ 25·3	180·9	+ 4·8		
20619	·989	258·7	260·9	−10·2	39	172
20618	·382	288·3	202·5	+11·4	80	435
1	·432	283·7	206·0	+10·2	13	68
10	28·296	+ 25·2	171·6	+ 4·8		
20618	·530	283·8	203·2	+11·3	85	410
1	·566	281·2	204·9	+10·2	10	56
10	29·505	+ 25·0	155·7	+ 4·6		
20620	·928	256·0	222·1	−11·0	23	136
20618	·740	281·0	203·2	+11·2	74	307
1	·768	279·8	205·8	+10·5	3	19
20621	·287	104·6	139·7	+ 0·3	31	107
1	·264	108·0	141·2	− 0·2	17	51
10	30·103	+ 25·0	147·8	+ 4·6		
20620	·963	256·2	220·5	−11·9	22	73
20618	·830	280·6	203·9	+11·3	53	254
1	·830	280·5	203·9	+11·3	53	252
20621	·152	119·6	140·3	+ 0·3	19	127
1	·126	132·2	142·5	− 0·3	11	55
20622	·601	82·4	111·0	+ 8·2	3	36

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
10	31·361	+ 24·8	131·2	+ 4·5		
20618	·957	280·2	204·6	+11·1	83	284
1	·957	280·2	204·6	+11·1	83	284
20621	·216	250·4	142·9	+ 0·2	37	215
1	·240	251·8	144·3	+ 0·1	29	161
20622	·323	79·7	112·6	+ 7·5	9	56
11	1·397	+ 24·6	117·6	+ 4·4		
20621	·442	261·7	143·4	+ 0·3	45	253
1	·463	262·0	144·7	+ 0·2	35	184
20622	·071	48·8	114·5	+ 7·0	1	15
11	2·401	+ 24·4	104·3	+ 4·3		
20621	·633	264·9	143·2	+ 0·1	66	335
1	·659	265·3	145·2	+ 0·1	42	218
20622	·151	295·4	112·2	+ 7·9	0	15
20623	·960	110·8	33·3	−18·5	4	16
20624	·969	83·8	28·4	+ 7·1	18	88
11	3·388	+ 24·3	91·3	+ 4·2		
20621	·794	266·3	143·5	− 0·3	69	397
1	·815	267·1	145·6	+ 0·1	34	187
20623	·876	113·7	33·9	−18·4	2	11
20624	·885	83·9	29·0	+ 7·3	10	59
11	4·375	+ 24·1	78·3	+ 4·1		
20621	·911	267·8	143·6	− 0·2	87	416
1	·927	268·7	146·1	+ 0·4	41	204
20623	·754	118·8	34·4	−18·4	0	3
20624	·775	82·8	27·6	+ 8·1	25	94
11	5·294	+ 23·9	66·2	+ 4·0		
20621	·975	268·2	142·9	− 0·7	21	202
20624	·609	81·5	28·8	+ 8·3	8	37
11	6·292	+ 23·7	53·0	+ 3·9		
20624	·409	81·1	29·1	+ 7·1	10	36

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
11	7·291	+ 23·5	39·9	+ 3·7		
20624	·192	71·9	29·3	+ 7·1	3	20
11	8·382	+ 23·3	25·5	+ 3·6		
20624	·087	327·6	28·1	+ 7·8	9	26
11	9·294	+ 23·1	13·4	+ 3·5		
20624	·273	284·2	28·8	+ 7·2	0	4
11	10·511	·	·	·	0	0
11	11·489	·	·	·	0	0
11	12·516	+ 22·3	331·0	+ 3·2		
011474	·324	37·3	319·1	+17·9	2	20
11	13·498	·	·	·	0	0
11	14·432	·	·	·	0	0
11	15·304	+ 21·6	294·2	+ 2·8		
20625	·997	79·7	208·6	+10·5	12	102
11	16·346	+ 21·3	280·5	+ 2·7		
021474	·757	281·1	329·3	+10·2	5	26
20625	·949	79·4	208·9	+10·9	20	90
11	17·328	+ 21·0	267·5	+ 2·6		
20625	·857	78·6	208·9	+11·1	18	100
20626	·964	78·0	193·1	+12·2	11	91
11	18·795	+ 20·6	248·2	+ 2·4		
20625	·642	75·3	209·1	+11·2	5	36
20626	·807	76·6	195·0	+12·2	16	100
11	19·293	+ 20·4	241·6	+ 2·4		
20625	·565	73·2	208·3	+11·3	5	22
20626	·730	75·4	195·5	+12·2	15	94
11	20·290	+ 20·1	228·5	+ 2·2		
20625	·423	67·1	205·2	+11·5	1	18
20626	·559	71·3	195·9	+12·2	16	75
20627	·992	85·7	146·0	+ 4·6	15	192
11	21·292	+ 19·8	215·3	+ 2·1		
20625	·231	36·7	207·2	+12·7	0	4
20626	·371	61·0	196·0	+12·3	22	93
031474	·515	64·6	186·7	+14·6	0	6
20627	·948	85·7	143·9	+ 4·7	36	244
20628	·989	84·2	134·0	+ 6·0	26	123
11	22·461	+ 19·4	199·9	+ 2·0		
20625	·225	322·0	208·0	+12·1	1	19
20626	·191	21·2	195·8	+12·2	13	93
20627	·827	85·6	144·3	+ 4·7	34	219
20628	·917	84·5	133·5	+ 5·8	14	89
11	23·397	+ 19·1	187·5	+ 1·9		
20625	·342	299·8	205·1	+11·5	0	12
20626	·230	320·0	196·2	+11·9	14	86
20629	·688	79·1	144·6	+ 8·8	3	16
20627	·685	85·1	144·5	+ 4·7	33	233
20628	·808	84·3	133·9	+ 5·7	3	48
11	24·320	+ 18·8	175·4	+ 1·7		
20626	·389	297·2	196·0	+11·8	7	23
20629	·507	75·2	145·8	+ 8·9	0	9
20627	·519	84·0	144·3	+ 4·6	31	180
20628	·670	83·4	133·5	+ 5·7	9	46

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
11	25·455	+ 18·4	160·4	+ 1·6		
20626	·600	287·0	196·1	+11·4	6	29
20627	·281	80·0	144·4	+ 4·3	23	141
20628	·462	81·9	133·2	+ 5·1	7	27
11	26·554	+ 18·0	145·9	+ 1·5		
20626	·778	283·2	196·2	+11·1	2	9
20627	·052	28·4	144·5	+ 4·1	22	150
20628	·231	74·4	133·1	+ 5·0	9	27
11	27·413	+ 17·7	134·6	+ 1·4		
20627	·177	285·9	144·4	+ 4·1	25	178
20628	·065	23·3	133·1	+ 4·8	4	19
11	28·501	+ 17·3	120·3	+ 1·2		
20627	·414	277·5	144·5	+ 4·2	24	126
20628	·231	287·3	133·0	+ 5·1	2	15
11	29·285	+ 17·0	109·9	+ 1·1		
20627	·570	275·5	144·5	+ 4·0	26	129
20628	·412	279·0	133·9	+ 4·7	2	19
11	30·295	+ 16·7	96·6	+ 1·0		
20627	·743	274·5	144·4	+ 4·0	17	127
20630	·733	277·3	143·4	+ 6·0	1	12
20628	·601	276·9	133·2	+ 4·9	0	16
12	1·397	+ 16·2	82·1	+ 0·9		
20630	·901	277·4	146·1	+ 7·0	0	10
20627	·889	274·4	144·6	+ 4·3	10	36
20631	·940	100·8	12·7	− 9·8	22	200
1	·940	100·8	12·7	− 9·8	22	200
12	2·474	+ 15·8	67·9	+ 0·7		
20627	·975	274·2	144·8	+ 4·2	4	29
20632	·313	147·5	57·9	−14·6	2	23
12	2·474	*continued*				
20631	·839	102·6	11·8	−10·0	17	200
1	·828	102·8	13·0	−10·1	13	161
12	3·283	+ 15·5	57·2	+ 0·6		
20632	·258	187·8	59·3	−14·1	6	21
20631	·727	105·0	11·9	−10·3	20	150
1	·715	105·3	12·9	−10·4	18	129
12	4·281	+ 15·1	44·1	+ 0·5		
20632	·382	226·3	60·6	−14·8	3	21
20631	·552	110·2	12·4	−10·5	20	132
1	·544	110·7	13·0	−10·6	20	121
12	5·283	+ 14·7	30·9	+ 0·4		
01474	·939	258·9	100·2	−10·3	0	22
20631	·385	120·5	11·3	−10·8	30	170
1	·368	122·3	12·5	−11·0	28	140
12	6·303	+ 14·3	17·4	+ 0·2		
20631	·226	148·0	10·5	−10·6	17	153
1	·216	155·9	12·3	−11·1	13	106
12	7·389	+ 13·8	3·1	+ 0·1		
20631	·240	214·5	11·0	−11·1	17	142
1	·260	219·5	12·8	−11·4	13	102
12	8·432	+ 13·4	349·4	− 0·1		
20631	·435	242·6	12·5	−11·4	15	101
1	·442	243·0	13·0	−11·6	13	92
12	9·466	+ 13·0	335·8	− 0·2		
01475	·931	262·0	43·9	− 7·5	3	20
20631	·624	251·3	12·7	−11·6	11	55
1	·634	251·9	13·6	−11·4	11	48
20633	·990	59·9	255·7	+29·7	0	57

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1963		°	°	°		
12	10·284	+12·6	325·0	− 0·3		
20631	·761	255·4	13·5	−11·2	5	38
1	·761	255·4	13·5	−11·2	5	38
20633	·956	58·6	255·2	+29·7	7	67
12	11·362	+12·1	310·8	− 0·4		
20631	·896	257·8	13·8	−11·1	0	9
1	·896	257·8	13·8	−11·1	0	9
20633	·874	55·1	255·4	+29·7	13	78
12	12·533	+11·6	295·4	− 0·6		
20633	·760	49·0	254·3	+29·4	5	41
12	13·474	+11·2	283·0	− 0·7		
20633	·646	38·8	255·4	+29·5	5	24
12	14·282	·	·	·	0	0
12	15·484	+10·3	256·5	− 0·9		
021475	·888	67·9	196·2	+19·0	0	18
12	16·325	·	·	·	0	0
12	17·475	+ 9·4	230·2	− 1·2		
021475	·955	88·6	157·8	+ 1·0	0	7
12	18·470	+ 8·9	217·1	− 1·3		
20634	·679	315·2	249·7	+27·6	5	25
12	19·462	+ 8·5	204·1	− 1·5		
20634	·799	306·9	250·0	+27·6	2	20
20635	·974	76·1	128·2	+13·1	0	4
12	20·497	+ 8·0	190·4	− 1·6		
20635	·881	74·6	130·1	+12·7	11	52
12	21·549	+ 7·5	176·6	− 1·7		
20635	·744	70·2	130·8	+13·4	8	44
12	22·456	+ 7·1	164·6	− 1·8		
20635	·597	63·7	131·3	+13·8	6	39
12	23·484	+ 6·6	151·1	− 2·0		
20635	·412	48·8	132·6	+13·8	0	11
12	24·436	+ 6·1	138·5	− 2·1		
20636	·877	285·4	198·2	+12·4	9	49
20635	·289	20·5	132·6	+13·6	4	19
12	25·291	+ 5·7	127·3	− 2·2		
20636	·955	283·1	198·9	+11·8	7	51
12	26·290	·	·	·	0	0
12	27·280	·	·	·	0	0
12	28·282	·	·	·	0	0
12	29·320	·	·	·	0	0
12	30·510	·	·	·	0	0
12	31·572	·	·	·	0	0

NOTES ON SUNSPOT GROUPS 1963

Group 20520.	Jan.	1 – 4	A small bi-polar group.
Group 20521.	Jan.	2 – 3	A pair of tiny spots on January 2; a single spot on January 3.
Group 20522.	Jan.	3 – 6	A single spot, dividing into two on January 5.
Group 20523.	Jan.	10 – 21	A regular spot with variable following companions.
Group 20524.	Jan.	14 – 21	A bi-polar group of rapid growth and decline.
Group 20525.	Jan.	17 – 18	A single tiny spot on January 17; several tiny spots on January 18.
Group 20526.	Jan.	23 – 25	One or two tiny spots.
Group 20527.	Jan.	25 – 26	A pair of tiny spots.
Group 20528.	Jan.	26 – 28	One or two tiny variable spots.
Group 20529.	Jan.	28 – Feb. 1	A bi-polar group developing rapidly as it approaches the west limb.
Group 20530.	Feb.	1 – 11	A stream of scattered spots, of which the leader, a composite spot, is the most persistent component. The whole group breaks up rapidly after February 8.
Group 20531.	Feb.	2 – 8	A variable stream which dies out near the central meridian.
Group 20532.	Feb.	6 – 18	A small regular spot.
Group 20533.	Feb.	16 – 25	Return of Group 20529. A diminishing regular spot, with occasional companions.
Group 20534.	Feb.	19 – 24	A small scattered stream of brief duration.
Group 20535.	Feb.	22 – 24	A tiny spot.
Group 20536.	Feb.	26 – 27	A pair of tiny spots.
Group 20537.	Mar.	3 – 13	A composite spot rapidly breaking up after March 7.
Group 20538.	Mar.	5 – 8	One or two tiny spots.
Group 20539.	Mar.	6 – 7	A single tiny spot on March 6; a pair on March 7.
Group 20539*.	Mar.	10 – 15	A single small spot until March 15, when several tiny spots occupy the position.
Group 20540.	Mar.	14 – 15	A few tiny spots.
Group 20541.	Mar.	15 – 27	A regular spot with variable following companions.
Group 20542.	Mar.	20 – 22	A few tiny spots.
Group 20543.	Mar.	21 – 22	One or two tiny spots.
Group 20544.	Mar.	26 – 27	A tiny cluster.
Group 20545.	Mar.	29 – Apr. 7	A stream led by a small regular spot, which alone remains on April 5.
Group 20546.	Apr.	5 – 11	A few small spots appearing near the central meridian and developing rapidly into a scattered stream; the leading spot alone remains on April 7.
Group 20547.	Apr.	6 – 13	A scattered stream, appearing near the central meridian, of which only the follower remains on April 11.
Group 20548.	Apr.	8 – 13	One or two small spots, not seen on April 11.
Group 20549.	Apr.	8 – 20	A pair of spots rapidly developing into a stream, of which the leader, a small regular spot, alone remains on April 12.
Group 20550.	Apr.	9 – 21	A bi-polar group consisting of two spots which become composite in structure by April 12. The leader breaks up into

		numerous small spots on April 13, whilst on April 16 the follower divides into two and similarly disintegrates.
Group 20551.	Apr. 11 – 13	One or two small variable spots immediately south of Group 20547.
Group 20552.	Apr. 28 – May 10	Return of Group 20547. A composite spot, breaking up by May 4 into several components, of which only one remains on May 7.
Group 20553.	May 4 – 7	A tiny variable stream.
Group 20554.	May 6 – 9	A small spot.
Group 20555.	May 6 – 7	One or two tiny spots.
Group 20556.	May 6 – 13	A stream led by a regular spot.
Group 20557.	May 7 – 8	A tiny spot.
Group 20558.	May 8 – 9	Several tiny spots on May 8; a single spot on May 9.
Group 20559.	May 9 – 12	A tiny spot which develops into a cluster on May 11.
Group 20560.	May 9 – 20	A regular spot.
Group 20561.	May 10 – 12	A tiny short-lived stream.
Group 20562.	May 10 – 20	A single spot, developing into a compact stream by May 14, after which the group breaks up. The leader alone remains on May 19.
Group 20563.	May 13 – 25	A few small spots developing into a moderate-sized compact stream by May 16. The leader, a composite spot, becomes regular in outline by May 22, and is the only survivor on May 24.
Group 20564.	May 15 – 22	A few tiny spots, with a rapid increase in area taking place on May 19, after which the group begins to die out.
Group 20565.	May 21 – 24	One or two tiny spots, rapidly developing into a bi-polar group as it passes round the limb.
Group 20566.	May 22 – 26	One or two tiny scattered spots.
Group 20567.	May 23 – 25	One or two tiny variable spots, not seen on May 24.
Group 20568.	May 24 – 27	One or two tiny spots.
Group 20569.	May 27 – June 4	A small stream, of which only the leader remains on June 3.
Group 20570.	May 27 – 30	One or two tiny spots.
Group 20571.	May 30 – June 3	A bi-polar group of rapid growth.
Group 20572.	June 4 – 5	One or two tiny spots.
Group 20573.	June 4 – 12	A tiny spot on the first two days. Nothing is seen on June 6, but a small compact stream appears on June 7, and begins to die out after June 10.
Group 20574.	June 5 – 10	Return of Group 20560. A small diminishing regular spot.
Group 20575.	June 7 – 18	A tiny spot, developing into a complicated stream of which the leader, a composite spot, is the most stable component.
Group 20576.	June 8 – 13	Return of Group 20565. A spot, with a double umbra, which divides into two on June 10. There are following companions on June 13.
Group 20577.	June 9 – 21	Return of Group 20563. A diminishing regular spot with variable companions.
Group 20578.	June 18 – 29	Tiny variable spots, not seen on June 20 or 25.

Group 20579.	June 23 – 26	A short-lived cluster of tiny spots.
Group 20580.	June 25 – July 3	A small stream of which the leading spot alone remains on July 1.
Group 20581.	June 25 – July 3	A single small spot until June 28, when other spots appear in the rear to form a small stream.
Group 20582.	June 28 – 30	A few tiny variable spots.
Group 20583.	July 1 – 2	One or two tiny spots.
Group 20584.	July 1 – 3	A few tiny spots, not seen on July 2.
Group 20585.	July 2 – 4	A tiny spot growing rapidly into a cluster of spots as it passes round the limb.
Group 20586.	July 3 – 15	Return of Group 20575. A stable regular spot.
Group 20587.	July 13 – 19	A few small spots in stream formation, of which the leader alone remains on July 18.
Group 20588.	July 19 – 27	A cluster of tiny spots, developing into an unstable stream by July 23.
Group 20589.	July 20 – 25	A few tiny spots, not seen on July 23 or 24.
Group 20590.	July 27 – 28	Two or three tiny spots.
Group 20591.	July 29 – Aug. 3	One or two tiny spots, rapidly developing into a stream led by a regular spot.
Group 20592.	July 29 – Aug. 9	A regular spot, with numerous following companions between July 30 and August 6.
Group 20593.	July 30 – Aug. 11	Return of Group 20586, third appearance. A few tiny spots developing into a stream, of which the leader becomes regular in outline and is the sole survivor from August 8.
Group 20594.	July 31 – Aug. 7	A small spot, breaking up and becoming a cluster by August 4.
Group 20595.	Aug. 6 – 7	One or two tiny spots.
Group 20596.	Aug. 12 – 24	A tiny spot which develops into a bi-polar group by August 17. By August 21 the rear part of the group is represented by two or three tiny spots.
Group 20597.	Aug. 18 – 24	A variable stream of scattered spots.
Group 20598.	Aug. 20 – 26	A stream of small scattered spots which develops into a bi-polar group by August 23.
Group 20599.	Aug. 21 – 26	A scattered stream of small spots.
Group 20600.	Aug. 22 – 23	Two or three tiny spots.
Group 20601.	Aug. 25 – Sept. 1	Return of Group 20592. Tiny variable spots, not seen from August 28 to 30.
Group 20602.	Aug. 26 – Sept. 6	Return of Group 20593, fourth appearance. A diminishing regular spot, with following companions between August 30 and September 2.
Group 20603.	Aug. 28 – 29	A tiny spot.
Group 20604.	Aug. 31 – Sept. 9	A tiny spot which develops, by September 4, into a stream led by a regular spot; this alone remains by September 7.
Group 20605.	Sept. 3 – 6	A tiny stream, of which a single spot remains on September 6.
Group 20606.	Sept. 4 – 5	A pair of tiny spots on September 4; a single spot on September 5.
Group 20607.	Sept. 9 – 18	A diminishing regular spot until September 17, when tiny followers appear.

Group 20608.	Sept. 10 – 16	A small spot until September 15, when there are several tiny scattered spots.
Group 20609.	Sept. 10 – 21	One or two tiny spots, developing into an extended complex stream by September 15. The leader becomes regular in outline from September 16.
Group 20610.	Sept. 14 – 26	A large complex spot, with multiple umbrae, of which the leading part is the most persistent throughout.
Group 20611.	Oct. 3 – 4	One or two tiny spots.
Group 20612.	Oct. 6 – 17	A stream led by a regular spot, which alone survives on October 12.
Group 20613.	Oct. 7 – 18	One or two tiny spots developing into a bi-polar group by October 9. The leader, a small regular spot, alone remains from October 14. This appears to be the first group of the new cycle.
Group 20614.	Oct. 11 – 13	Return of Group 20610. A small spot.
Group 20615.	Oct. 11 – 15	A diminishing regular spot.
Group 20616.	Oct. 14 – 20	A cluster of rapid growth and decline.
Group 20617.	Oct. 18 – 19	A few tiny scattered spots.
Group 20618.	Oct. 20 – 31	A moderate-sized stream led by a regular spot, which alone survives on October 31. On October 26 a small leading part of the regular spot becomes detached and dies out by October 31.
Group 20619.	Oct. 24 – 27	A tiny spot which develops rapidly into a stream as it passes round the limb.
Group 20620.	Oct. 29 – 30	A stream suddenly appearing near the west limb.
Group 20621.	Oct. 29 – Nov. 5	A few spots which appear near the central meridian and rapidly become a stream led by a regular spot.
Group 20622.	Oct. 30 – Nov. 2	A small variable stream.
Group 20623.	Nov. 2 – 4	A tiny spot.
Group 20624.	Nov. 2 – 9	Return of Group 20612. A small spot developing into a variable stream on November 4.
Group 20625.	Nov. 15 – 23	Return of Group 20618. A small spot, breaking up on November 20 and forming a variable cluster.
Group 20626.	Nov. 17 – 26	A small unstable spot.
Group 20627.	Nov. 20 – Dec. 2	A regular spot with occasional companions.
Group 20628.	Nov. 21 – 30	A small spot breaking up into several components on November 27.
Group 20629.	Nov. 23 – 24	One or two tiny spots.
Group 20630.	Nov. 30 – Dec. 1	One or two tiny spots.
Group 20631.	Dec. 1 – 11	A stream, led by a regular spot which alone survives from December 10.
Group 20632.	Dec. 2 – 4	A few tiny spots.
Group 20633.	Dec. 9 – 13	A few spots in stream formation.
Group 20634.	Dec. 18 – 19	One or two tiny spots in high northern latitude.
Group 20635.	Dec. 19 – 24	A single spot on December 19; a pair of spots from December 20 to December 22 and a small cluster subsequently.
Group 20636.	Dec. 24 – 25	A small spot with following companions.

GENERAL CATALOGUE OF GROUPS OF SUNSPOTS FOR THE YEAR 1963

Groups of sunspots, lasting for two or more days, are numbered in the *first* column in continuation of the group numbers given for 1962. Groups seen on one day only are not included in this catalogue but are given with a distinctive numeration in a following table on page 92.

The *second* column gives the U.T. of the central meridian passage of each group as deduced from its mean longitude (given in the *tenth* column). For those groups which are in existence at the time of the central meridian passage of their longitude, the time is given to $0^d{\cdot}01$, corresponding to $0^\circ{\cdot}13$ of solar longitude. In other cases, in which groups disappear before or appear after the central meridian, the deduced time is given to $0^d{\cdot}1$.

The *third* column gives the duration of each group in days. Intermittent groups, *i.e.* groups which are not seen upon the photographs of every day between their first and last appearances, are indicated by a fraction, the numerator of which represents the number of days on which they are actually observed, the denominator being the number of days covering the extreme limits of observation.

The *fifth* and *seventh* columns, headed 'Longitude from central meridian', give, for the days on which each group was first and last seen respectively, the heliographic longitude from the meridian passing through the centre of the Sun's disk at the time of observation, longitudes west of the centre being reckoned as positive.

The mean areas for umbrae and whole spots entered in the *eighth* and *ninth* columns are corrected for the effect of foreshortening and are expressed in millionths of the Sun's visible hemisphere.

The *tenth* and *eleventh* columns give the mean heliographic position of the group in longitude and latitude respectively.

When a group is 80° or more from the Sun's central meridian, or in cases of close proximity to the Sun's limb when only part of the group is visible, the measures for that day are not included in deriving the mean area or the mean longitude and latitude of the group.

The *twelfth* column gives reference to recurrent groups. The numeration is in continuation of the recurrent series given in Ledger I of the *Greenwich Photo-Heliographic Results* for 1955; bracketed numbers indicate the order of a group in the series.

With reference to the identification of recurrent groups, it should be noted that longitudes are based on the ephemeris given in the *Astronomical Ephemeris*, assuming a solar rotation period constant at all latitudes. After an interval of one rotation, recurring groups will, therefore, show in general—apart from any proper motion they may have of their own—apparent drifts in longitude varying in amount according to their respective latitudes. The following table, derived from the formula $\xi = 14^\circ{\cdot}37 - 2^\circ{\cdot}60 \sin^2\phi$, gives the apparent drift in longitude appropriate to different latitudes after an interval of 27 days, a drift ~~towards~~ corresponding to an increase in heliographic longitude.

Latitude	..	Drift *forwards*	Latitude	..	Drift *backwards*
0°	..	5°	20°	..	3°
5°	..	4·5	25°	..	7·5
10°	..	3	30°	..	12.5
15°	..	0·5	35°	..	18

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbrae	Whole Spots	Long.	Lat.	
	1963	d	1963	°	1963	°			°	°	
20520	Jan. 2·98	4	Jan. 1	−23	Jan. 4	+19	8	59	150·3	+18·5	
20521	Jan. 5·5	2	2	−42	3	−30	0	13	116·6	− 0·8	
2	Dec. 31·7	4	3	+32	6	+74	1	29	179·9	− 6·4	
3	Jan. 15·97	12	10	−74	21	+74	34	177	339·4	+10·0	
4	16·04	8	14	−22	21	+71	35	169	338·4	+ 6·5	
5	14·3	2	17	+40	18	+52	0	15	1·5	+ 8·1	
20526	26·7	3	23	−42	25	−16	1	11	197·7	+11·3	
7	25·2	2	25	+ 4	26	+17	1	18	217·9	+10·7	
8	Feb. 1·3	3	26	−77	28	−52	1	13	124·3	+ 3·3	
20529	Jan. 26·4	5	28	+26	Feb. 1	+77	59	370	202·0	+ 9·6	1939 (1)
20530	Feb. 6·16	11	Feb. 1	−65	11	+70	36	190	60·3	−15·7	
20531	9·0	7	2	−81	8	−11	12	70	22·5	+11·6	
2	12·12	13	6	−76	18	+83	22	103	341·9	+ 9·4	
3	22·14	10	16	−77	25	+43	13	67	209·9	+ 9·2	1939 (2)
4	21·04	6	19	−26	24	+46	2	21	224·4	+ 6·6	
5	22·62	3	22	− 2	24	+24	0	7	203·6	+10·9	
20536	28·6	2	26	−30	27	−16	2	24	124·8	+ 7·0	
7	Mar. 9·60	11	Mar. 3	−84	Mar. 13	+50	21	132	6·3	+11·8	
8	10·6	4	5	−70	8	−29	0	6	352·6	+12·6	
9	11·2	2	6	−65	7	−50	0	15	344·6	+ 9·2	
9*	14·14	6	10	−49	15	+17	2	12	306·5	+14·5	
20540	10·5	2	14	+51	15	+67	0	7	354·9	+13·8	
1	21·60	13	15	−80	27	+78	33	182	208·1	+11·8	
2	22·34	3	20	−28	22	0	0	12	198·3	+14·8	
3	16·7	2	21	+61	22	+75	0	11	273·0	−12·7	
4	24·3	2	26	+30	27	+43	0	13	172·8	−11·5	
20545	Apr. 1·27	10	29	−38	Apr. 7	+83	15	90	67·3	− 5·7	
6	5·50	7	Apr. 5	− 3	11	+84	13	82	11·6	+ 1·3	
7	7·54	8	6	−16	13	+76	17	99	344·7	+16·2	1940 (1)
8	8·0	5/6	8	+ 2	13	+71	6	38	338·2	+11·4	
9	14·59	13	8	−84	20	+75	10	57	251·6	−18·7	
20550	14·93	13	9	−72	21	+83	58	421	247·0	−10·9	
1	7·6	3	11	+48	13	+79	2	41	344·0	+15·6	
2	May 4·75	13	28	−82	May 10	+75	26	201	345·2	+16·2	1940 (2)
3	9·2	4	May 4	−65	7	−26	2	15	286·2	+ 8·5	
4	4·9	4	6	+19	9	+58	4	19	342·7	+13·7	
20555	5·0	2	6	+19	7	+30	0	10	341·6	+18·7	
6	7·60	8	6	−18	13	+77	25	125	307·6	−13·3	
7	9·0	2	7	−22	8	− 8	1	6	289·6	+ 6·8	
8	6·3	2	8	+26	9	+40	2	12	324·3	+ 0·9	
9	12·11	4	9	−38	12	0	2	18	247·9	− 9·1	
20560	14·84	12	9	−74	20	+74	35	200	211·8	− 7·8	1941 (1)
1	9·6	3	10	+11	12	+33	3	22	281·2	+10·0	
2	14·20	11	10	−51	20	+85	15	88	220·2	+10·3	
3	19·61	13	13	−83	25	+78	88	572	148·8	+ 8·3	1942 (1)
4	15·84	8	15	− 8	22	+84	16	105	198·7	+13·8	
20565	18·5	4	21	+40	24	+80	21	150	164·0	+ 3·9	1943 (1)
6	28·6	5	22	−79	26	−32	1	18	29·5	+11·5	
7	28·8	2/3	23	−72	25	−46	2	27	26·7	+13·9	
8	28·3	4	24	−55	27	−13	1	13	33·7	+ 9·2	
9	30·83	9	27	−47	June 4	+63	8	51	0·4	+14·0	

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbræ	Whole Spots	Long.	Lat.	
	1963	d	1963	°	1963	°			°	°	
20570	June 1·8	4	May 27	−76	May 30	−32	2	14	333·7	+ 3·9	
1	May 28·2	5	30	+27	June 3	+81	29	183	34·7	+10·9	
2	June 5·28	2	June 4	−12	5	+ 1	1	10	288·2	+ 9·4	
3	9·05	8/9	4	−64	12	+47	4	33	238·3	−12·1	
4	10·8	6	5	−74	10	− 7	9	46	214·5	− 9·2	1941 (2)
20575	11·94	12	7	−67	18	+85	85	535	200·0	+13·0	1944 (1)
6	14·1	6	8	−77	13	− 5	12	53	171·8	+ 2·7	1943 (2)
7	15·60	13	9	−83	21	+78	22	136	151·6	+ 8·1	1942 (2)
8	23·54	10/12	18	−72	29	+82	0	13	46·5	+12·8	
9	21·0	4	23	+30	26	+73	5	42	80·0	+ 7·5	
20580	27·99	9	25	−34	July 3	+77	12	61	347·6	+ 8·3	
1	July 1·48	9	25	−80	3	+26	6	37	301·3	+14·1	
2	June 24·6	3	28	+54	June 30	+72	0	19	32·4	+10·9	
3	28·8	2	July 1	+34	July 2	+46	1	9	337·1	+ 6·9	
4	July 1·97	2/3	1	− 9	3	+19	0	5	294·9	+13·7	
20585	June 28·4	3	2	+52	4	+81	14	79	342·5	+10·4	
6	July 9·13	13	3	−75	15	+84	32	176	200·2	+12·4	1944 (2)
7	13·63	7	13	− 6	19	+80	5	30	140·6	+ 2·2	
8	24·65	9	19	−71	27	+34	4	44	354·7	+10·1	
9	20·26	4/6	20	− 3	25	+69	2	15	52·8	+ 9·8	
20590	24·8	2	27	+33	28	+49	1	13	353·2	+ 2·4	
1	28·3	6	29	+14	Aug. 3	+82	27	130	306·3	+12·7	
2	Aug. 3·95	12	29	−74	9	+72	51	291	218·5	+11·2	1945 (1)
3	5·09	13	30	−80	11	+85	31	171	203·5	+10·0	1944 (3)
4	5·59	8	31	−70	7	+24	7	34	196·8	+13·0	
20595	8·6	2	Aug. 6	−30	7	−16	1	7	157·6	+ 7·4	
6	18·13	13	12	−83	24	+81	18	103	31·1	−11·5	
7	24·60	7	18	−80	24	+ 2	11	78	305·6	− 8·5	
8	20·1	7	20	+ 1	26	+80	29	162	5·3	+ 7·4	
9	20·3	6	21	+14	26	+83	31	157	1·9	− 5·8	
20600	20·6	2	22	+26	23	+40	1	13	358·3	− 8·8	
1	31·08	5/8	25	−77	Sept. 1	+18	2	18	220·0	+11·1	1945 (2)
2	Sept. 1·02	12	26	−76	6	+72	16	83	207·6	+ 8·9	1944 (4)
3	2·8	2	28	−70	Aug. 29	−58	0	8	184·3	+12·0	
4	3·97	10	31	−53	Sept. 9	+77	10	55	168·5	+ 4·0	
20605	4·17	4	Sept. 3	−11	6	+29	1	15	165·9	+11·5	
6	1·9	2	4	+31	5	+49	3	14	195·4	+12·4	
7	15·33	10	9	−80	18	+40	9	52	18·5	+ 5·7	
8	15·36	7	10	−68	16	+14	1	11	18·1	− 5·9	
9	16·05	12	10	−78	21	+76	45	227	9·1	− 9·8	
20610	20·44	13	14	−82	26	+79	171	1119	311·1	+12·9	1946 (1)
1	29·8	2	Oct. 3	+46	Oct. 4	+62	1	14	188·1	+11·2	
2	Oct. 12·02	12	6	−75	17	+72	35	206	26·3	+ 8·0	1947 (1)
3	11·99	12	7	−60	18	+82	20	97	26·8	+34·4	
4	17·4	3	11	−80	13	−54	0	10	314·9	+13·6	1946 (2)
20615	17·9	5	11	−86	15	−34	14	60	308·5	+23·9	
6	14·58	7	14	− 5	20	+76	29	154	352·5	+ 3·3	
7	17·5	2	18	+13	19	+26	0	16	314·6	+14·1	
8	26·04	12	20	−78	31	+73	113	602	201·4	+11·7	1948 (1)
9	21·6	4	24	+35	27	+80	7	35	260·3	−10·5	

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbræ	Whole Spots	Long.	Lat.	
	1963	d	1963	°	1963	°			°	°	
20620	Oct. 24·5	2	Oct. 29	+66	Oct. 30	+73	23	105	221·4	−11·5	
1	30·51	8	29	−16	Nov. 5	+77	47	257	142·5	0·0	
2	Nov. 1·77	4	30	−37	2	+ 8	3	31	112·6	+ 7·7	
3	7·7	3	Nov. 2	−71	4	−44	2	10	33·9	−18·5	
4	8·14	8	2	−76	9	+15	10	46	28·7	+ 7·5	1947 (2)
20625	21·87	9	15	−86	23	+18	6	38	207·6	+11·6	1948 (2)
6	22·78	10	17	−75	26	+50	12	69	195·6	+12·0	
7	26·67	13	20	−83	Dec. 2	+77	24	149	144·5	+ 4·4	
8	27·50	10	21	−81	Nov. 30	+37	6	34	133·4	+ 5·3	
9	26·6	2	23	−43	24	−30	2	13	145·2	+ 8·9	
20630	26·6	2	30	+47	Dec. 1	+64	1	11	144·8	+ 6·6	
1	Dec. 6·70	11	Dec. 1	−69	11	+63	16	123	12·2	−10·8	
2	3·13	3	2	−10	4	+17	4	22	59·3	−14·5	
3	15·6	5	9	−80	13	−28	8	53	255·1	+29·6	
4	16·0	2	18	+33	19	+46	4	23	249·9	+27·6	
20635	25·0	6	19	−76	24	− 6	5	28	131·0	+13·4	
6	19·9	2	24	+60	25	+72	8	50	198·6	+12·1	

GENERAL CATALOGUE OF SUNSPOTS

SUNSPOTS SEEN ON ONE DAY ONLY

The groups of sunspots tabulated below were seen on one day only and appear in the *Daily Results* with a distinctive numeration, comprising the number of the rotation during which each was observed prefixed by a number, in smaller type, given in order of appearance. These short-lived groups are usually composed of one or two very small spots. The deduced time of central meridian passage of each spot is given in the fourth column of the table.

Number of Group	Date	Longitude from Central Meridian	U.T. of Central Meridian Passage	Area Corrected for Foreshortening		Position of Group	
				Umbræ	Whole Spots	Longitude	Latitude
	1963	°	1963			°	°
1462 04	Jan. 5	− 2·9	Jan. 5·5	0	10	117·1	+ 7·4
05	7	+33·6	4·8	8	38	126·4	+17·1
1463 01	23	−15·9	24·8	0	9	223·4	+ 8·9
02	Feb. 5	−68·1	Feb. 10·6	0	10	2·0	+12·3
1464 01	11	+16·9	10·0	0	4	9·6	− 0·1
02	14	−59·6	18·9	0	13	252·1	−11·1
03	16	+53·1	12·4	0	4	338·6	+13·9
04	16	−64·7	21·3	0	5	220·9	+ 7·0
05	16	−76·7	22·2	0	15	208·8	+12·5
06	27	− 6·5	27·9	0	5	134·6	+15·2
07	Mar. 5	+38·9	Mar. 2·4	0	4	101·7	− 0·1
1465 01	10	+ 1·7	10·4	0	7	355·1	+12·6
02	10	+ 0·5	10·5	0	2	353·9	+ 3·8
03	14	+ 8·5	13·8	0	15	311·2	−12·2
04	18	+69·3	13·3	0	6	317·4	+12·5
05	24	+75·3	18·7	0	13	246·8	−18·4
06	Apr. 1	−56·5	Apr. 5·6	0	18	10·0	− 7·0
07	2	−49·4	6·3	0	6	1·3	+11·8
08	4	− 9·8	5·1	0	7	17·2	+12·6
09	6	+56·2	2·1	0	4	56·7	− 5·9
1466 01	11	+72·3	5·9	0	15	6·8	+ 3·1
02	12	+31·6	10·0	1	12	312·0	− 8·8
03	22	+64·2	17·5	0	6	212·6	+13·2
04	30	−24·2	May 2·2	3	14	19·2	+10·4
1467 01	May 9	+ 1·0	9·3	0	3	285·7	+ 8·0
02	10	+13·3	9·4	1	11	283·6	+15·9
03	13	+27·3	11·3	0	3	258·5	−10·5
04	13	−25·6	15·3	0	6	205·6	−11·7
05	18	− 8·9	19·0	0	8	156·8	+ 3·6
06	29	−69·6	June 3·6	0	6	310·5	−13·6
1468 01	June 2	+68·9	May 28·2	0	3	35·7	− 8·0
02	12	−65·6	June 17·4	0	2	127·9	+ 0·3
03	14	+55·6	10·1	0	20	223·8	+12·1
04	18	+64·3	13·5	0	4	179·3	+10·5
1469 01	July 9	−14·8	July 10·5	1	7	181·8	+ 4·5
02	23	+27·1	21·3	0	4	39·3	− 0·3
03	23	−13·5	24·3	0	6	358·8	−12·8
1470 01	27	−59·6	31·8	0	5	259·7	+ 3·6
02	Aug. 14	−23·2	Aug. 16·1	3	15	58·2	+10·6
03	18	−28·4	20·5	0	9	359·1	− 9·5
1471 01	22	+19·1	21·2	0	4	351·0	− 7·7
02	29	−50·5	Sept. 2·2	2	7	192·4	+12·9
03	31	−55·8	4·5	0	12	161·0	+ 2·4
04	Sept. 2	+35·3	Aug. 30·8	1	12	223·8	− 9·6
05	3	+26·0	Sept. 1·4	0	4	203·0	+12·0
06	5	−25·1	7·4	0	3	122·7	+14·3

GENERAL CATALOGUE OF SUNSPOTS

SUNSPOTS SEEN ON ONE DAY ONLY

Number of Group	Date	Longitude from Central Meridian	U.T. of Central Meridian Passage	Area Corrected for Foreshortening		Position of Group	
				Umbræ	Whole Spots	Longitude	Latitude
	1963	°	1963			°	°
1472 01	Sept. 19	+53·5	Sept. 15·5	0	8	16·5	+ 9·0
02	25	− 7·8	25·9	2	15	238·6	−19·8
03	28	+62·2	23·6	2	31	269·0	+ 8·2
1473 01	Oct. 14	−32·0	Oct. 16·8	0	4	323·7	+12·0
02	17	− 2·9	17·6	0	14	312·1	− 5·0
1474 01	Nov. 12	−11·8	Nov. 13·4	2	20	319·1	+17·9
02	16	+48·8	12·6	5	26	329·3	+10·2
03	21	−28·6	23·5	0	6	186·7	+14·6
04	Dec. 5	+69·3	30·0	0	22	100·2	−10·3
1475 01	9	+68·2	Dec. 4·3	3	20	43·9	− 7·5
02	15	−60·3	20·1	0	18	196·2	+19·0
03	17	−72·5	23·0	0	7	157·8	+ 1·0

TOTAL AREAS OF SUNSPOTS AND FACULAE

Projected and Corrected for Foreshortening for each day

The place where the photograph was taken is indicated in the second column. A photograph taken at Herstmonceux is indicated by the letter H, and those taken at the Cape, Kodaikanal and Mount Wilson by the letters C, K and W respectively.

The projected area is the area as it is measured on the photograph, uncorrected for foreshortening and expressed in millionths of the Sun's apparent disk.

The area corrected for foreshortening is expressed in millionths of the Sun's visible hemisphere.

The areas of faculae are given separately for the Sun's western and eastern hemispheres.

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1963

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
JANUARY								
1 C	18	141	94	468	12	93	84	605
2 C	32	194	157	501	18	111	189	562
3 C	10	169	105	451	5	93	134	533
4 C	16	136	335	440	10	83	387	586
5 C	0	49	367	398	0	35	444	458
6 C	0	26	252	366	0	46	342	404
7 C	12	59	472	482	8	38	567	528
8 C	0	0	334	376	0	0	422	502
9 H	0	0	575	238	0	0	667	312
10 H	17	82	455	292	33	160	462	369
11 H	34	148	358	238	36	162	489	286
12 H	39	223	217	304	29	174	280	327
13 H	45	205	293	162	27	127	394	152
14 H	185	762	347	43	101	417	435	35
15 H	185	1078	282	76	95	558	368	110
16 K	150	795	110	240	77	409	159	392
17 C	125	805	335	63	67	436	433	106
18 C	121	599	303	240	73	361	290	400
19 C	79	388	357	345	57	277	430	399
20 C	65	230	586	188	63	224	680	219
21 H	15	109	412	238	29	205	537	258
22 H	0	0	152	174	0	0	203	197
23 H	2	41	184	325	1	26	249	374
24 C	2	19	105	263	1	12	110	329
25 H	4	50	261	174	2	27	345	228
26 H	0	28	184	282	0	19	169	414
27 H	0	18	401	358	0	19	439	396
28 C	14	127	293	418	8	79	355	461
29 C	55	455	295	400	37	302	359	531
30 C	86	466	189	347	72	397	203	403
31 H	39	373	347	401	54	521	445	471
FEBRUARY								
1 H	77	354	294	490	157	715	472	538
2 H	97	488	196	554	84	452	237	732
3 C	112	587	524	649	88	479	509	801
4 H	117	661	174	336	73	427	183	486
5 H	118	623	196	554	67	361	198	624
6 C	82	506	190	317	56	354	235	350
7 C	75	454	337	400	52	308	420	467
8 C	86	390	316	558	60	264	347	607
9 C	55	234	358	222	37	157	408	227
10 C	61	285	359	222	41	185	382	230
11 C	40	236	338	305	24	154	398	347
12 C	47	201	360	191	25	105	436	247
13 H	33	161	512	371	18	88	558	426
14 H	28	183	414	218	17	115	549	241
15 C	51	157	425	223	36	110	477	269
16 C	15	105	402	286	14	131	432	501
17 H	42	176	297	428	53	224	398	588
18 H	28	188	209	713	38	253	339	756
19 C	38	184	264	561	24	119	282	556
20 H	30	177	176	307	17	99	236	322
21 H	24	143	121	242	13	75	160	289
22 H	27	156	165	198	14	82	242	228
23 H	17	101	319	341	9	58	381	408
24 H	9	82	440	418	5	53	503	506
25 H	4	22	286	220	3	16	314	236
26 H	2	51	572	264	1	30	662	363
27 H	4	40	352	385	2	22	441	482
28 H	0	0	451	473	0	0	602	525

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
MARCH								
1 H	0	0	319	495	0	0	366	511
2 H	0	0	286	484	0	0	333	603
3 H	0	9	319	473	0	54	378	583
4 H	26	191	605	429	41	303	652	548
5 C	36	266	372	808	36	266	453	1009
6 C	57	290	287	840	42	223	318	840
7 H	49	329	495	649	30	207	568	651
8 H	35	298	385	451	19	164	427	518
9 C	43	186	193	279	23	99	221	336
10 H	15	103	220	451	9	58	307	506
11 C	15	88	528	216	9	55	606	266
12 H	11	64	253	198	7	40	299	232
13 H	6	46	958	242	4	33	1051	267
14 H	0	45	429	286	0	27	526	328
15 H	9	85	684	298	32	246	949	451
16 H	15	122	364	563	23	190	502	725
17 H	38	221	244	410	36	207	351	493
18 H	58	299	199	476	40	211	240	478
19 H	51	290	178	200	31	174	252	205
20 C	71	348	312	194	39	194	392	196
21 C	54	320	151	205	29	178	162	225
22 H	58	347	344	211	31	189	431	260
23 C	54	310	183	172	31	177	281	202
24 H	47	293	211	233	31	201	279	299
25 H	42	191	510	211	36	165	523	231
26 H	22	167	400	200	29	207	473	278
27 H	13	80	556	289	37	188	823	354
28 H	0	0	178	233	0	0	256	282
29 H	17	143	200	111	11	91	272	154
30 C	50	282	174	163	29	160	224	210
31 C	47	331	195	476	24	171	223	596
APRIL								
1 H	46	263	200	725	23	140	214	770
2 H	26	208	212	535	14	111	244	590
3 H	24	136	134	314	14	77	164	331
4 H	13	76	224	471	9	48	253	493
5 H	7	51	281	180	6	34	318	211
6 H	76	463	438	190	42	261	498	224
7 H	103	640	302	157	62	376	477	192
8 H	118	568	191	168	74	366	197	225
9 H	71	467	617	370	74	500	703	479
10 C	67	534	380	467	60	481	499	508
11 H	122	798	641	327	89	633	767	312
12 C	153	998	500	327	101	691	573	392
13 H	138	843	450	416	83	559	697	479
14 C	134	906	250	415	68	460	342	378
15 C	123	1048	109	414	64	531	129	399
16 H	159	1097	237	281	85	589	284	303
17 H	108	844	101	236	66	531	181	255
18 H	117	849	461	203	83	604	428	219
19 H	76	560	844	248	70	518	873	238
20 C	42	278	459	77	59	395	679	115
21 H	9	65	293	350	33	241	501	409
22 H	0	5	508	225	0	6	545	263
23 H	0	0	361	406	0	0	514	483
24 C	0	0	263	241	0	0	376	272
25 C	0	0	185	348	0	0	182	406
26 H	0	0	215	509	0	0	278	606
27 H	0	0	271	644	0	0	350	709
28 H	11	68	158	598	51	325	212	793
29 C	20	156	198	649	36	278	245	832
30 H	30	336	204	601	29	336	236	616

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1963

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
MAY								
1 C	55	452	110	374	42	347	128	401
2 H	54	515	170	453	34	324	211	436
3 H	55	459	160	262	31	257	234	271
4 H	64	483	80	182	34	262	115	186
5 H	43	278	250	319	23	154	260	520
6 H	79	381	511	353	44	216	547	524
7 H	96	496	387	568	53	277	455	600
8 H	105	502	330	466	62	302	353	471
9 H	99	525	502	353	105	515	564	603
10 H	107	655	478	524	90	553	755	606
11 H	98	600	376	582	70	427	439	621
12 K	88	512	210	294	62	349	219	334
13 H	101	630	481	308	87	476	587	421
14 C	142	953	489	588	116	799	575	768
15 H	199	1396	343	618	137	1065	436	699
16 H	279	2017	470	607	179	1329	563	664
17 H	245	1548	469	275	151	933	652	289
18 C	292	1675	410	189	169	1004	486	241
19 H	272	1502	769	322	172	948	827	402
20 C	207	1253	577	221	144	939	760	305
21 H	138	799	494	92	95	600	782	148
22 H	124	715	252	184	80	525	419	396
23 C	129	829	345	389	114	756	326	518
24 H	105	667	849	344	156	1033	986	392
25 H	43	268	184	241	101	580	333	307
26 H	2	16	230	563	1	10	257	741
27 H	4	69	207	404	3	54	277	445
28 H	33	163	127	587	20	105	163	676
29 C	33	180	223	445	18	106	381	553
30 H	54	325	208	495	29	175	259	710
31 H	69	482	81	554	43	302	78	725
JUNE								
1 C	55	346	680	691	45	277	743	809
2 H	26	177	598	311	33	233	769	395
3 H	2	18	438	610	2	20	653	690
4 C	2	25	335	479	2	18	330	546
5 H	9	76	554	541	14	93	707	644
6 H	16	64	299	818	16	65	350	1020
7 H	37	196	230	598	24	130	372	647
8 H	35	325	115	472	32	261	126	497
9 H	147	774	565	485	176	786	719	693
10 H	231	1297	357	588	158	907	440	714
11 H	244	1752	426	485	143	1034	524	555
12 H	403	2108	598	646	214	1133	731	681
13 H	307	1840	668	415	170	1024	852	446
14 C	223	1630	627	392	132	979	758	427
15 H	196	1227	680	312	134	855	802	314
16 C	114	789	806	325	105	724	906	341
17 C	63	345	493	336	89	502	663	353
18 H	27	140	599	414	19	152	1041	553
19 C	13	69	493	415	11	56	560	496
20 K	21	70	372	319	21	71	403	363
21 H	0	45	587	415	0	59	757	438
22 H	2	21	380	357	1	11	518	396
23 H	0	33	219	611	0	18	267	674
24 H	21	173	322	807	15	123	358	854
25 H	60	277	507	588	49	267	557	716
26 H	69	368	427	427	46	249	603	560
27 H	58	287	519	774	35	177	585	851
28 H	37	203	440	381	21	124	505	424
29 H	23	141	462	484	13	98	720	640
30 K	0	47	287	307	0	37	375	400

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
JULY								
1 H	6	91	475	336	3	53	547	375
2 H	2	39	577	288	2	32	613	325
3 H	44	251	624	531	68	368	687	629
4 C	32	231	403	426	48	370	650	459
5 H	39	224	370	601	30	170	435	657
6 C	65	366	225	336	40	228	282	317
7 H	67	293	196	450	37	160	264	570
8 H	72	337	335	371	37	173	410	414
9 C	58	318	314	191	29	161	395	188
10 H	51	310	496	254	27	165	580	289
11 C	38	296	190	258	22	170	234	272
12 H	42	243	289	300	30	171	326	346
13 H	37	233	646	173	31	189	727	192
14 H	42	218	634	451	41	220	833	599
15 H	10	92	520	393	23	193	709	498
16 H	2	32	428	485	1	19	441	606
17 H	11	47	473	659	9	37	544	730
18 C	7	27	460	437	8	32	529	458
19 H	2	25	393	370	3	37	484	498
20 H	2	77	370	623	2	68	434	735
21 H	9	81	300	659	5	50	364	698
22 H	12	76	288	427	7	44	353	518
23 H	12	104	208	612	6	55	274	718
24 H	23	185	415	393	12	93	521	465
25 H	12	120	565	415	9	74	639	432
26 H	0	39	682	589	0	22	885	751
27 H	2	74	449	496	1	46	587	531
28 H	0	9	669	415	0	7	752	511
29 H	12	49	564	357	21	71	689	490
30 H	71	407	656	438	57	336	939	624
31 H	178	977	496	691	139	752	652	756
AUGUST								
1 H	202	1041	633	853	141	717	763	912
2 H	168	881	265	392	113	569	316	457
3 C	144	940	90	403	91	604	193	521
4 C	166	1219	123	314	84	618	126	369
5 H	216	1142	243	507	111	587	273	539
6 H	209	1074	277	392	115	593	368	370
7 H	143	765	150	278	92	488	174	296
8 H	104	542	646	184	83	439	747	179
9 H	72	406	762	208	85	494	911	233
10 C	24	125	401	89	39	204	516	112
11 H	12	55	427	404	55	254	660	446
12 H	0	2	369	472	0	10	428	606
13 H	0	5	485	403	0	8	612	485
14 H	5	30	542	530	3	17	610	654
15 H	4	39	427	542	2	27	565	701
16 K	2	53	210	265	1	32	218	337
17 C	51	405	378	490	27	218	425	521
18 H	88	401	150	519	72	367	199	680
19 H	79	446	149	551	66	406	178	739
20 H	60	369	172	447	43	259	213	451
21 H	84	384	367	206	55	261	442	295
22 H	116	555	528	425	80	374	601	523
23 H	144	688	493	287	112	543	607	344
24 H	94	597	492	138	87	591	597	173
25 C	43	275	599	200	70	448	708	312
26 H	16	91	606	240	30	182	941	338
27 H	20	144	469	640	21	150	545	754
28 H	32	188	514	447	23	142	557	498
29 H	39	213	628	492	25	134	766	582
30 K	34	180	387	293	19	99	533	368
31 C	38	294	333	344	22	161	359	384

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1963

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
SEPTEMBER								
1 H	41	180	422	500	21	93	510	647
2 H	45	193	445	582	23	105	565	699
3 H	25	151	411	456	14	85	457	516
4 C	44	291	528	176	25	156	580	184
5 H	48	300	626	216	28	170	774	264
6 H	27	177	489	114	16	115	544	136
7 H	18	93	285	114	13	69	333	120
8 C	13	75	198	176	14	80	190	213
9 H	10	62	148	454	23	151	201	590
10 H	13	107	68	579	19	162	96	806
11 H	25	145	147	715	19	118	138	733
12 H	34	204	125	864	25	149	128	961
13 H	147	674	0	488	98	453	0	523
14 C	190	1092	0	550	182	1411	0	762
15 H	263	1717	91	975	218	1626	123	1172
16 H	328	2054	250	997	236	1532	272	1003
17 H	473	2512	328	270	297	1576	340	295
18 H	403	2382	294	192	235	1376	334	217
19 H	388	2595	746	192	213	1418	806	188
20 H	487	2754	970	79	272	1492	967	90
21 C	435	2633	841	185	245	1503	1099	244
22 H	356	2170	271	166	195	1187	372	215
23 H	217	1493	304	169	145	999	296	179
24 H	174	1198	720	136	145	1000	714	154
25 H	80	703	1148	552	93	818	1336	615
26 C	50	343	598	501	117	806	959	506
27 C	0	0	185	272	0	0	206	260
28 H	2	29	293	371	2	31	311	399
29 C	0	0	174	249	0	0	225	307
30 C	0	0	185	119	0	0	235	139
OCTOBER								
1 C	0	0	194	87	0	0	225	79
2 H	0	0	191	191	0	0	240	192
3 C	2	37	239	260	1	26	251	336
4 H	0	2	405	428	0	2	410	523
5 C	0	0	205	497	0	0	270	546
6 C	21	160	97	508	38	294	122	632
7 H	56	344	202	672	59	357	244	800
8 C	93	479	86	1068	73	375	99	1171
9 H	125	692	100	702	81	442	86	730
10 H	135	669	157	573	77	380	219	644
11 C	129	657	172	517	78	488	259	745
12 H	108	539	189	737	73	357	198	877
13 H	108	585	258	660	66	363	330	637
14 H	94	510	267	424	57	311	287	477
15 H	118	603	490	156	71	371	539	155
16 C	154	742	678	194	100	493	693	194
17 H	81	565	824	189	72	470	1019	236
18 H	47	305	589	300	47	295	784	391
19 H	24	120	478	178	26	120	535	223
20 C	71	344	699	463	164	791	814	573
21 H	157	761	956	588	179	877	974	733
22 H	189	1202	751	839	148	949	951	834
23 H	274	1550	544	332	169	969	811	369
24 C	240	1412	215	247	130	780	242	284
25 C	239	1398	300	182	125	726	345	227
26 H	166	1093	477	278	96	604	578	355
27 H	159	856	320	264	119	607	544	296
28 C	144	696	191	276	85	410	190	309
29 H	176	722	496	231	128	550	576	241
30 H	115	635	333	172	97	490	414	208
31 C	139	693	519	255	129	555	610	265

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
NOVEMBER								
1 H	82	483	396	374	46	268	651	490
2 H	115	603	550	440	88	454	737	564
3 H	95	551	429	451	81	467	458	563
4 H	104	469	396	858	112	513	467	941
5 C	22	151	425	362	29	239	544	407
6 C	19	66	287	563	10	36	352	619
7 C	6	40	224	288	3	20	307	399
8 H	17	51	286	539	9	26	324	631
9 C	0	8	95	563	0	4	99	626
10 H	0	0	429	330	0	0	576	376
11 H	0	0	220	319	0	0	217	522
12 H	4	37	506	495	2	20	514	605
13 H	0	0	341	649	0	0	432	709
14 H	0	0	330	418	0	0	381	529
15 C	2	17	255	286	12	102	318	407
16 C	19	91	265	445	25	116	230	520
17 C	25	153	476	594	29	191	487	773
18 H	27	174	276	498	21	136	353	503
19 C	29	165	180	592	20	116	246	636
20 C	33	208	85	328	32	285	101	469
21 C	71	387	381	465	84	470	461	658
22 H	78	539	318	723	62	420	384	780
23 H	84	610	308	549	53	395	310	582
24 C	79	433	359	432	47	258	384	480
25 H	66	364	495	330	36	197	637	398
26 H	63	363	829	261	33	186	997	283
27 H	57	387	512	262	29	197	600	285
28 H	48	259	426	446	26	141	614	499
29 C	46	247	379	326	28	148	452	401
30 C	25	213	515	379	18	155	572	445
DECEMBER								
1 H	24	180	590	405	32	246	645	457
2 H	25	275	635	327	23	252	677	329
3 C	38	246	557	495	26	171	753	524
4 C	40	259	316	453	23	153	390	504
5 C	57	329	274	389	30	192	335	456
6 C	33	298	168	464	17	153	216	546
7 H	33	276	339	643	17	142	410	752
8 H	28	182	521	283	15	101	608	410
9 H	19	117	304	337	14	132	398	555
10 C	10	90	387	189	12	105	509	274
11 C	13	84	325	419	13	87	386	490
12 H	7	54	446	543	5	41	614	692
13 H	7	37	76	283	5	24	101	353
14 C	0	0	84	295	0	0	82	386
15 H	0	17	217	359	0	18	260	408
16 C	0	0	178	566	0	0	205	587
17 H	0	4	283	423	0	7	326	513
18 H	7	37	522	500	5	25	577	582
19 H	2	26	738	511	2	24	782	543
20 H	11	50	554	588	11	52	720	630
21 H	11	59	250	315	8	44	355	310
22 H	9	63	609	283	6	39	763	360
23 H	0	20	457	87	0	11	625	125
24 H	16	85	577	174	13	68	601	222
25 C	4	31	273	178	7	51	335	231
26 C	0	0	84	168	0	0	124	187
27 C	0	0	73	345	0	0	69	419
28 C	0	0	167	168	0	0	175	224
29 C	0	0	272	271	0	0	319	300
30 H	0	0	272	543	0	0	431	750
31 H	0	0	76	261	0	0	111	261

MEAN AREAS OF SUNSPOTS AND FACULAE FOR EACH ROTATION OF THE SUN FROM 1963 JANUARY 14 TO 1964 JANUARY 3

The mean areas have been formed by taking the means of the areas for each day of observation throughout each rotation of the Sun, the projected areas being the areas as measured on the photographs and expressed in millionths of the Sun's apparent disk, and the areas corrected for foreshortening being expressed in millionths of the Sun's visible hemisphere.

The rotations adopted in the following table (which is in continuation of those for the years 1873–1962; see page 52) correspond to the synodic rotation of the Sun, and the commencement of each is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node of the Sun's equator on the ecliptic at mean noon on January 1, 1854, and the assumed period of the Sun's sidereal rotation being 25·38 days. The numeration of the rotations is in continuation of Carrington's series (*Observations of Solar Spots made at Redhill* by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The dates of commencement of the rotations are given in U.T.

No. of Rotation	Rotation Commenced	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
			Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1463	1963 January 14·40	28	72	390	606	52	285	728
1464	February 10·74	27	25	146	756	19	113	889
1465	March 10·08	28	32	192	622	22	137	749
1466	April 6·38	27	65	462	682	48	346	809
1467	May 3·63	27	118	720	769	86	537	960
1468	May 30·85	27	89	543	958	63	383	1153
1469	June 27·05	27	29	174	834	22	134	989
1470	July 24·25	28	73	421	837	52	297	1012
1471	August 20·48	27	71	412	790	56	354	943
1472	September 16·73	27	142	851	737	93	566	847
1473	October 14·02	27	113	616	823	86	459	980
1474	November 10·31	28	36	232	824	26	173	969
1475	December 7·63	27	5	38	642	4	32	775

MEAN AREAS OF SUNSPOTS AND FACULAE FOR THE YEAR

The mean projected areas are expressed in millionths of the Sun's apparent disk.

The mean areas corrected for foreshortening are expressed in millionths of the Sun's visible hemisphere.

Year	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
		Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1963	365	65	391	759	47	288	907

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR EACH ROTATION OF THE SUN, FROM 1963 JANUARY 14 TO 1964 JANUARY 3

The numbers given in the accompanying table have been formed as follows:

The heliographic latitude of each spot for each day has been multiplied by its area (corrected for foreshortening), and the sum of the products, for spots north of the equator, has been divided by the sum of the corresponding areas to form the mean heliographic latitude of spotted area north of the equator; similarly for spots south of the equator. In forming the mean heliographic latitude of entire spotted area, the algebraic sum of the products for spots north and south of the equator has been divided by the sum of the areas; and for the mean distance from the equator of all spots the numerical sum of the products, without regard to the sign of latitude, has been similarly divided.

The mean areas have been formed by dividing the sum of the daily areas (corrected for foreshortening) by the number of days of observation for each rotation of the Sun and are expressed in millionths of the Sun's visible hemisphere.

No. of Rotation	Rotation Commenced	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
				°		°	°	°
1463	1963 January 14·40	28	212	9·13	73	15·95	+ 2·72	10·87
1464	February 10·74	27	110	10·28	3	12·12	+ 9·78	10·32
1465	March 10·08	28	105	11·41	32	6·54	+ 7·17	10·26
1466	April 6·38	27	122	13·88	225	11·94	− 2·87	12·62
1467	May 3·63	27	408	9·06	129	10·02	+ 4·48	9·29
1468	May 30·85	27	363	11·20	20	10·54	+10·07	11·17
1469	June 27·05	27	134	11·14	0·4	7·89	+11·08	11·13
1470	July 24·25	28	250	11·08	47	10·46	+ 7·67	10·98
1471	August 20·48	27	244	10·16	110	8·64	+ 4·60	9·69
1472	September 16·73	27	526	13·92	40	11·19	+12·15	13·73
1473	October 14·02	27	402	10·41	57	3·81	+ 8·64	9·59
1474	November 10·31	28	129	7·00	44	10·62	+ 2·52	7·92
1475	December 7·63	27	23	20·51	9	11·18	+ 8·19	17·33

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR THE YEAR

Year	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
			°		°	°	°
1963	365	229	11·04	59	10·43	+ 6·61	10·92

SUMMARY OF SOLAR ACTIVITY FOR THE YEAR 1963

Chief features of the record for 1963 are as follows:

(1) With the approach of minimum phase, sunspot activity continued to decrease, the mean daily area for the year being 288.

(2) The largest spot group crossed the Sun's central meridian on September 20·4 in latitude 13° North; its mean area was 1119 millionths.

In addition there were three other groups with mean areas exceeding 500 millionths.

(3) There were 30 spot-free days during the year.

(4) The ratio of mean corrected areas of faculae/sunspots was 3·50 and that of mean corrected areas of umbrae/whole spots 0·163.

(5) The number and distribution, northern and southern hemispheres, of spot groups of

(*a*) two days' duration or longer

(*b*) one day's duration

were as follows:

	(*a*)	(*b*)
Northern spots	94	37
Southern spots	24	21
Total	118	58

(6) The following table gives the mean daily areas of sunspots (projected and corrected values) and faculae (corrected only) for each calendar month.

Month	Spots		Faculae
	Projected	Corrected	Corrected
January	251	175	723
February	248	194	827
March	185	144	838
April	409	303	815
May	688	507	916
June	495	349	1161
July	190	147	1046
August	432	323	946
September	877	622	875
October	593	434	908
November	236	186	977
December	91	69	848

PHOTOHELIOGRAPHIC RESULTS

1964

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PHOTOHELIOGRAPHIC RESULTS 1964

INTRODUCTION

The photographs from which these measures were made were taken at the Royal Greenwich Observatory, the Royal Observatory, Cape of Good Hope, and the Kodaikanal Observatory, Southern India.

The photographs of the Sun obtained at Herstmonceux were taken with the 4-inch photoheliograph, of which the original object-glass had been replaced in 1910 by a Grubb photographic objective. The equivalent focal length of the photoheliograph with its present enlarging system (supplied in 1926 by Ross, Ltd.) is 67½ feet, the diameter of the Sun's image at the secondary focus being approximately 7½ inches.

The photographs of the Sun obtained at the Cape Observatory were taken under the superintendence of Her Majesty's Astronomer at the Cape, Dr. R. H. Stoy, and those at Kodaikanal under the superintendence of the Director, Dr. M. K. Vainu Bappu. At the Cape Observatory the instrument employed was a 4-inch photoheliograph giving an image of the Sun about 7½ inches in diameter; at Kodaikanal a Cooke photo-visual objective of 6 inches aperture was used, the image of the Sun which was obtained being of about the same size.

Photographs of the Sun were available for measurement on 366 days in 1964, those finally selected for measurement being supplied by the different observatories as under:

Herstmonceux	217
Cape	144
Kodaikanal	5
Total	366

The names of the measurers of the photographs for the year 1964 were as follows:

P. S. Laurie	Miss D. M. Hobden
G. W. Rickett	Miss M. E. Winter

At the primary focus of the photoheliographs at Herstmonceux and the Cape two spider-wires are fixed by which the zero of position angles on the photographs can be determined. These wires are inclined at an angle of 45° to the celestial equator. In the Kodaikanal instrument there is one wire fixed parallel to the equator.

The precise zero of position angles for the photoheliographs has been determined by three different methods.

(i) *Zero Photographs.* Plates were exposed twice, with an interval of about 100 seconds between the two exposures, the instrument being firmly clamped. Two images of the Sun, overlapping each other by about a fifth part of the Sun's diameter, were thus produced upon the plates. The exposures were so made that the line joining the cusps passed approximately through the centre of the plates and the inclinations of the two spider-wires to this line were measured. A small correction for the inclination of the Sun's path has been applied. Two or three zero photographs were usually taken each month at Herstmonceux, the Cape and Kodaikanal.

(ii) *Transits.* At Herstmonceux and the Cape, transits of the Sun were taken visually, the times of contact of the first and second limbs of the Sun with the two wires being noted by an eye-and-ear method. The ratio of the time taken by the Sun to pass over the NE–SW wire to the time taken to pass over the SE–NW wire was used in order to find the angle made by the Sun's path with the bisectors of the wires. From this, again incorporating a correction to allow for the inclination of the Sun's path, the orientation of the wires with respect to the N–S line could be inferred. Transits were usually taken at Herstmonceux and the Cape on four or more days during each month.

(iii) *Supplementary Zero Photographs.* At Herstmonceux supplementary partial images of the Sun were occasionally recorded on otherwise normal photographs, a second exposure being made after clamping the instrument firmly for 130 seconds. The small portion of the Sun's limb visible at the western edge of the plate could be used, together with the main image which it does not intersect, to deduce the orientation of the wires in a way similar to that used for the zero photographs. Six to ten supplementary zero photographs were taken at Herstmonceux each month. The values for the zero of position angles deduced from them were given half weight in the adoption of zero corrections to be used in the reduction of photographs.

The measures of the photographs were made with a large position-micrometer that can be used for photographs of the Sun up to 12 inches in diameter. In this micrometer the photograph is held with its film-side uppermost on three pillars fixed on a circular plate, which can be turned through a small angle about a pivot in its circumference by means of a screw and antagonistic spring acting at the opposite extremity of the diameter. The pivot of this plate is mounted on the circumference of another circular plate which can be turned by a similar screw-action about a pivot in its circumference. This pivot, 90° distant from that of the upper plate, is mounted on a third circular plate, with a position-circle graduated in divisions of 30 minutes of arc, which may be rotated about its centre. By this means small movements in two directions at right angles to each other can be readily given and the photograph can be accurately centred with respect to the centre of rotation of the position-circle. When this has been done, a Ramsden eyepiece, having at its anterior focus a glass diaphragm ruled with cross-lines into squares with sides of one hundredth of an inch (for measurement of areas), is moved along a slide adjusted so that the centre of the eyepiece moves diametrically across the photograph, the diaphragm being nearly in contact with the photographic film, so that parallax is negligible. The distance of a spot or facula from the centre of the disk is read from a scale and vernier to 1/250th of an inch, corresponding to 0·001 of the Sun's radius for images 8 inches in diameter. The position angle is read from the large position-circle which rotates with the photographic plate. The photograph is illuminated by diffused light reflected from white paper placed at an angle of 45° below the photograph.

In the case of large or complex groups of spots, the chief components were measured individually; so also in the case of groups near to the east or west limbs of the Sun where the effects of foreshortening are appreciable. In other cases the position of the centre of a group was estimated by the measurer at the micrometer or derived during the computation.

When required, corrections have been applied to the measured distances and position angles to allow for differential refraction. The details of this correction were given in the *Introduction* to the *Greenwich Photo-Heliographic Results* for 1909. It is necessary to apply this correction to about twenty per cent of the photographs taken at Herstmonceux in the months October to March.

1. *Positions and Areas of Sunspots for each Day in the Year* 1964 (p. 106).

In this section the measured positions and areas of sunspots are given for each day. The positions of sunspots are referred firstly to a system of apparent polar co-ordinates on the Sun's disk and secondly to a system of heliographic co-ordinates. Notes on the sunspot groups are given at the end of this section (p. 125).

The calculations of heliographic longitude and latitude are made from formulae given by W. de la Rue, B. Stewart and B. Loewy, *Phil. Trans.*, 1869. The system of heliographic co-ordinates may be defined as follows. The inclination of the Sun's axis to the ecliptic is assumed to be 82° 45′, the longitude of the ascending node of the Sun's equator on the ecliptic for 1964·0 to be 75° 15′·5, and the period of the Sun's sidereal rotation to be 25·38 days. The meridian which passed through the ascending node on 1854 January 1, Greenwich mean noon, is taken as the zero meridian and longitudes increase from east to west. The mean synodic rotation period is 27·2753 days; synodic rotation periods are counted from 1853 November 9, in continuation of Carrington's series.

Let r be the measured distance of a spot from the centre of the Sun's apparent disk and χ the position angle of the spot from the Sun's axis, R the measured radius of the Sun on the photograph, S the tabular semi-diameter of the Sun in arc, and ρ, ρ' the angular distances of a spot from the centre of the apparent disk, as viewed from the Sun's centre and from the Earth respectively. ρ — the heliocentric angle — is obtained from the following equations:

$$\rho' = \frac{r}{R} S \qquad \sin(\rho + \rho') = \frac{r}{R}$$

If B_0 and ϕ are the heliographic latitudes and L_0 and λ the heliographic longitudes of the Earth and the spot respectively,

$$\sin \phi = \cos \rho \sin B_0 + \sin \rho \cos B_0 \cos \chi$$
$$\sin (L_0 - \lambda) = \sin \chi \sin \rho \sec \phi$$

χ is found from the position angle measured eastwards from the north point of the Sun's disk by subtracting P, the position angle of the north end of the Sun's axis also measured eastwards from the north point. The three quantities P, B_0 and L_0 for the time of the exposure of each photograph are derived from the *Ephemeris for Physical Observations of the Sun*, given on p. 310 of the *Astronomical Ephemeris for* 1964.

2. *General Catalogue of Groups of Sunspots for* 1964 (p. 128).

This catalogue first contains particulars of every group of sunspots which lasted for two or more days during 1964. The group numbers are in continuation of those given in 1963 and previous years. The table includes an indication of those groups which may be considered to be members of 'recurrent series' of groups.

Spot groups seen on one day only are given in a separate table, where they receive a distinctive numeration.

Recurrent groups were selected upon the following plan, reference being made to the General Catalogue. If any spot when first seen was 60° or more to the east of the central meridian, the catalogue and, if necessary, the Daily Results also (Section 1), were searched some fifteen to sixteen days earlier to ascertain whether a spot group of similar heliographic longitude and latitude was then near the west limb of the Sun. Similarly, if any spot group when last seen was 60° or more to the west of the central meridian, a search was made fifteen to sixteen days later. When there appeared to be a case of probable continuity between groups in consecutive rotations of the Sun, the character of the groups, their areas and their longitude and latitude have been carefully compared before accepting them as a recurrent group.

3. *Total Areas, Mean Areas and Mean Heliographic Latitudes of Sunspots and Faculae in the Year* 1964 (p. 132).

This section contains total areas of sunspots and faculae (the latter separated into west and east hemispheres) for each day in the year, together with mean areas and mean heliographic latitudes of sunspots and faculae for each rotation of the Sun during 1964. Similar annual mean values are also given.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR 1964

The first line for each day gives the month numerically, the date and decimal of a day reckoned from midnight, the position angle of the Sun's axis from the north point and the heliographic longitude and latitude of the centre of the disk, all being computed for the time of the photograph.

Col. 1. Number of spot group in order of appearance and in continuation of the group numbers given for 1963. Single figures (1 = leader, 2 = follower) beneath the number of a spot group indicate the principal and most stable components of that group. (The areas of such components are already included in the total area of the group.) Groups seen on one day only are distinguished by the number of the rotation during which they were observed and prefixed by a number in smaller type giving the order of their appearance.

Col. 2. Distance of spot group from Sun's centre in units of the Sun's radius.

Col. 3. Position angle of spot group measured from the north pole of the Sun's axis in the direction *N. E. S. W. N.*

Col. 4. Heliographic longitude of spot group derived from the measures.

Col. 5. Heliographic latitude of spot group similarly derived.

Col. 6. Area of umbrae corrected for foreshortening and expressed in millionths of the Sun's visible hemisphere.

Col. 7. Area of whole spots composing the group similarly expressed.

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
01	1·301	·	·	·	0	0
01	2·280	+ 1·9	22·1	− 3·1		
20637	·345	54·0	5·7	+ 8·7	0	14
01475	·439	120·0	358·9	−15·5	1	4
01	3·281	+ 1·4	8·9	− 3·2		
01475	·523	278·6	39·9	+ 1·7	1	12
20637	·226	32·2	1·9	+ 7·7	0	2
01	4·314	+ 0·9	355·3	− 3·4		
20638	·814	96·1	300·8	− 7·0	0	2
01	5·559	+ 0·3	338·9	− 3·5		
20638	·615	98·3	301·1	− 7·9	3	17
20639	·627	94·8	300·2	− 5·8	5	27
01	6·293	− 0·1	329·2	− 3·6		
20639	·463	97·4	301·8	− 6·5	5	31
20640	·494	85·2	299·9	− 0·8	0	3
01	7·319	− 0·6	315·7	− 3·7		
20639	·251	103·5	301·6	− 6·8	8	34
20640	·257	80·1	301·1	− 1·1	1	9
01	8·285	− 1·1	303·0	− 3·8		
20639	·071	172·7	302·4	− 7·8	0	7
20640	·049	16·4	302·2	− 1·1	0	5
01	9·283	− 1·5	289·8	− 3·9		
20640	·236	281·6	303·1	− 1·1	0	4
20639	·207	253·7	301·3	− 7·1	0	5
01	10·450	− 2·1	274·5	− 4·0		
01476	·470	122·1	249·8	−18·1	0	10
01	11·295	− 2·5	263·3	− 4·1		
20640	·674	274·2	305·4	− 0·2	3	17
01	12·296	− 3·0	250·2	− 4·2		
20640	·819	272·5	304·9	− 0·3	0	25
01	13·505	− 3·6	234·2	− 4·4		
20640	·937	271·8	303·5	+ 0·1	0	18
01476	·254	147·7	226·1	−16·7	0	6
20641	·491	58·1	209·2	+11·0	6	25
01	14·284	− 3·9	224·0	− 4·4		
20640	·983	270·2	303·0	− 0·6	0	5
20642	·305	16·3	219·0	+12·5	8	40
20641	·347	43·5	210·0	+10·2	1	20
01	15·293	− 4·4	210·7	− 4·6		
20642	·330	332·3	219·7	+12·4	4	30
20641	·248	355·5	211·8	+ 9·7	1	12
01	16·459	− 5·0	195·3	− 4·7		
20642	·499	304·4	220·1	+12·1	2	26
20641	·403	308·0	214·1	+ 9·9	1	9
01	17·467	− 5·4	182·1	− 4·8		
20642	·700	292·4	223·3	+11·9	0	6
01	18·392	− 5·9	169·9	− 4·9		
20643	·657	291·4	208·1	+10·0	3	11

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
01	19·311	− 6·3	157·8	− 4·9		
20643	·802	287·3	208·8	+10·7	0	5
20644	·988	79·9	78·0	+ 9·1	31	190
01	20·286	− 6·7	144·9	− 5·0		
20644	·931	78·3	77·8	+ 8·9	31	143
20645	·983	79·9	66·9	+ 8·9	0	39
01	21·298	− 7·2	131·6	− 5·1		
20644	·821	75·5	78·3	+ 8·8	27	157
20645	·915	77·9	67·0	+ 8·9	2	28
01	22·285	− 7·6	118·6	− 5·2		
20644	·677	70·5	78·5	+ 9·0	35	156
20645	·794	74·1	68·2	+ 9·2	0	14
01	23·312	− 8·1	105·1	− 5·3		
20644	·499	62·0	78·7	+ 8·8	28	160
01	24·394	− 8·6	90·9	− 5·4		
20644	·319	39·8	79·0	+ 8·9	22	145
031476	·743	54·8	50·3	+21·2	1	19
01	25·460	− 9·1	76·8	− 5·5		
20644	·252	351·7	78·9	+ 8·9	22	125
01	26·314	− 9·4	65·6	− 5·6		
20644	·336	317·2	78·9	+ 8·8	28	141
01	27·650	−10·0	48·0	− 5·7		
20644	·565	294·5	79·2	+ 8·7	16	123
01	28·446	−10·4	37·5	− 5·7		
20646	·724	271·6	83·7	− 2·7	25	120
20644	·697	289·1	79·2	+ 8·9	23	89
01	29·385	−10·8	25·1	− 5·8		
20646	·864	269·7	84·8	− 3·1	63	378
20644	·829	284·2	79·3	+ 8·3	13	35
01	30·426	−11·2	11·4	− 5·9		
20646	·964	268·5	86·1	− 2·9	107	545
20644	·939	281·2	79·9	+ 8·4	0	13
01	31·291	−11·6	0·0	− 5·9		
20646	·989	267·2	81·5	− 3·7	26	197
02	1·292	·	·	·	0	0
02	2·437	·	·	·	0	0
02	3·295	·	·	·	0	0
02	4·456	·	·	·	0	0
02	5·542	·	·	·	0	0
02	6·510	·	·	·	0	0
02	7·476	−14·4	265·4	− 6·4		
20647	·370	263·6	287·2	− 8·3	0	1
02	8·470	−14·8	252·4	− 6·5		
20647	·589	264·1	288·5	− 8·6	3	36

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1964		°	°	°		
02	9·466	−15·2	239·2	− 6·5		
20647	·778	264·4	290·5	− 8·4	12	47
21477	·571	40·4	216·2	+19·7	0	4
02	10·292	−15·5	228·4	− 6·6		
20647	·888	264·2	291·4	− 8·1	2	39
02	11·509	−15·9	212·3	− 6·7		
20647	·977	262·1	290·6	− 9·1	0	9
02	12·343	·	·	·	0	0
02	13·562	·	·	·	0	0
02	14·122	·	·	·	0	0
02	15·484	−17·3	160·0	− 6·8		
20648	·920	90·8	93·2	− 3·5	14	71
20649	·981	78·9	82·8	+ 9·4	0	10
02	16·365	−17·6	148·4	− 6·9		
20648	·820	89·6	93·4	− 3·7	13	64
20649	·921	77·0	83·3	+ 9·1	0	14
02	17·398	−18·0	134·8	− 6·9		
21477	·744	276·1	182·3	− 0·0	0	12
20648	·664	88·0	93·3	− 3·9	13	58
20649	·812	73·6	82·9	+ 9·0	0	9
02	18·301	−18·3	122·9	− 7·0		
20648	·491	85·7	93·7	− 4·0	13	54
20650	·769	70·7	75·6	+10·1	0	9
02	19·325	−18·6	109·4	− 7·0		
20648	·276	81·4	93·6	− 4·4	6	28
20650	·563	62·6	79·2	+ 8·9	0	15
02	20·611	−19·0	92·5	− 7·0		
20648	·048	333·8	93·7	− 4·6	5	16
20650	·362	40·3	78·9	+ 9·1	11	60
02	21·441	−19·2	81·6	− 7·1		
20648	·216	280·2	93·8	− 4·7	2	11
20650	·276	6·4	79·8	+ 8·8	14	85
20651	·693	71·4	40·2	+ 7·5	0	13
02	22·304	−19·5	70·2	− 7·1		
20648	·402	274·4	93·8	− 4·7	3	14
20650	·326	325·6	80·9	+ 8·6	13	105
20651	·552	64·2	40·2	+ 7·7	3	33
02	23·293	−19·8	57·2	− 7·1		
20648	·600	271·6	94·0	− 4·7	4	13
20650	·477	303·0	80·9	+ 8·5	5	65
20651	·377	47·7	40·9	+ 7·8	23	115
02	24·358	−20·1	43·1	− 7·1		
20648	·777	269·9	94·2	− 4·6	2	10
20650	·655	290·9	81·1	+ 7·9	0	17
20651	·262	5·5	41·7	+ 7·9	41	173
02	25·393	−20·4	29·5	− 7·2		
20648	·901	268·4	93·9	− 4·6	0	15
20651	·338	320·7	41·9	+ 8·1	27	196
02	26·438	−20·7	15·7	− 7·2		
20648	·983	266·7	95·4	− 4·6	0	11
20651	·523	299·0	43·2	+ 8·3	28	186

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1964		°	°	°		
02	27·414	− 21·0	2·9	− 7·2		
20652	·730	278·6	49·0	+ 1·2	1	15
20651	·691	290·4	43·6	+ 8·5	47	250
02	28·310	− 21·2	351·1	− 7·2		
20652	·850	276·2	48·6	+ 1·4	4	31
20651	·818	285·9	43·6	+ 8·6	25	238
20653	·526	67·0	322·1	+ 5·5	0	4
02	29·322	− 21·5	337·8	− 7·2		
20652	·943	273·9	47·8	+ 1·2	6	85
20651	·933	282·4	44·8	+ 8·7	26	189
20653	·357	52·7	321·3	+ 5·5	0	4
20654	·602	93·3	300·6	− 7·7	0	2
03	1·343	− 21·7	324·3	− 7·2		
20651	·993	280·1	45·8	+ 9·0	32	237
20653	·223	3·5	323·5	+ 5·6	0	12
20654	·382	92·7	301·8	− 7·7	0	4
03	2·311	− 21·9	311·6	− 7·2		
20654	·153	92·6	302·7	− 7·6	0	2
03	3·318	− 22·2	298·3	− 7·2		
20653	·519	296·4	326·1	+ 6·9	1	8
03	4·341	− 22·4	284·8	− 7·3		
20653	·702	287·8	327·0	+ 7·0	0	13
03	5·401	− 22·7	270·8	− 7·3		
20653	·851	282·5	327·4	+ 6·6	0	7
03	6·366	− 22·9	258·1	− 7·3		
20653	·949	279·5	328·4	+ 6·6	0	3
03	7·447	− 23·1	243·9	− 7·3		
20655	·138	108·2	236·3	− 9·7	0	5
03	8·399	− 23·3	231·3	− 7·2		
20655	·111	241·5	237·0	−10·2	0	2
03	9·362	·	·	·	0	0
03	10·473	·	·	·	0	0
03	11·528	− 23·9	190·1	− 7·2		
20656	·745	273·3	238·1	− 2·4	0	8
20657	·776	5·9	183·9	+43·2	6	58
03	12·504	− 24·1	177·2	− 7·2		
20656	·859	269·0	236·5	− 4·4	16	51
20657	·774	352·9	184·7	+42·9	20	124
20658	·945	97·5	105·8	− 9·3	0	26
03	13·543	− 24·3	163·6	− 7·2		
20656	·958	267·1	237·1	− 4·8	3	64
20659	·537	289·0	194·0	+ 3·8	1	12
20657	·801	338·8	186·2	+41·6	15	76
20658	·840	98·9	105·9	−11·2	0	10
03	14·149	− 24·4	155·6	− 7·2		
20656	·990	267·4	237·5	− 3·6	0	27
20659	·645	285·0	194·1	+ 4·0	13	60
20657	·834	332·4	186·6	+41·5	11	75

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
03	15·388	−24·6	139·2	− 7·2		
20659	·842	279·6	195·3	+ 4·1	53	294
20657	·907	323·2	186·0	+41·8	2	35
03	16·433	−24·7	125·5	− 7·1		
20659	·946	277·5	195·4	+ 4·6	34	245
20657	·953	319·6	182·8	+42·9	0	21
20660	·991	78·5	45·1	+10·2	25	194
03	17·336	−24·9	113·6	− 7·1		
20659	·995	275·8	196·9	+ 5·0	31	288
20660	·943	76·6	45·1	+10·1	22	172
03	18·485	−25·0	98·4	− 7·1		
20660	·822	72·7	45·8	+ 9·8	21	172
03	19·302	−25·1	87·6	− 7·1		
20660	·707	68·4	46·0	+ 9·8	24	169
03	20·361	−25·3	73·7	− 7·0		
20660	·538	59·1	45·9	+ 9·8	26	151
03	21·435	−25·4	59·5	− 7·0		
20661	·356	324·9	71·5	+10·0	5	26
20660	·366	38·7	46·2	+ 9·7	21	137
03	22·306	−25·5	48·0	− 7·0		
20661	·477	303·6	71·7	+ 8·9	40	192
20660	·290	7·1	46·0	+ 9·7	22	144
03	23·319	−25·6	34·7	− 6·9		
20661	·649	293·1	71·7	+ 9·2	37	236
20660	·347	325·6	46·1	+ 9·8	18	116
03	24·671	−25·7	16·9	− 6·9		
20661	·835	286·1	71·1	+ 9·4	39	270
20660	·555	299·7	46·0	+ 9·9	19	123
03	25·477	−25·8	6·2	− 6·8		
20661	·920	283·5	71·2	+ 9·6	27	213
20660	·689	293·0	46·2	+10·4	26	113
03	26·332	−25·9	355·0	− 6·8		
20661	·979	281·0	71·4	+ 9·3	14	86
20660	·813	287·8	46·6	+10·2	21	126
03	27·347	−26·0	341·6	− 6·8		
20660	·921	284·1	46·5	+10·1	22	116
20662	·715	96·0	295·7	− 9·0	0	3
03	28·360	−26·0	328·2	− 6·7		
20660	·987	281·6	47·4	+10·3	12	68
20662	·544	96·5	295·2	− 9·1	6	37
03	29·323	−26·1	315·5	− 6·7		
20662	·312	97·7	297·3	− 8·7	1	14
03	30·324	·	·	·	0	0
03	31·308	·	·	·	0	0
04	1·337	−26·3	275·7	− 6·5		
20663	·959	74·8	204·5	+12·6	0	16
04	2·084	−26·3	265·9	− 6·5		
20663	·920	72·5	201·8	+13·3	0	15

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
04	3·320	·	·	·	0	0
04	4·313	·	·	·	0	0
04	5·355	− 26·4	222·7	− 6·3		
011479	·870	304·6	275·3	+25·8	2	18
04	6·575	− 26·4	206·6	− 6·2		
20664	·945	71·7	138·6	+15·0	3	41
04	7·325	− 26·4	196·7	− 6·1		
021479	·751	39·8	163·1	+30·1	2	10
20664	·875	68·4	139·4	+15·5	4	26
04	8·326	− 26·4	183·5	− 6·1		
031479	·363	307·6	200·3	+ 6·9	0	4
20664	·750	62·7	139·9	+15·8	7	24
04	9·327	− 26·3	170·3	− 6·0		
20664	·604	52·9	140·3	+16·1	4	14
04	10·409	− 26·3	156·0	− 5·9		
20664	·451	33·9	140·9	+16·2	1	7
041479	·409	126·7	135·7	−19·7	0	4
04	11·386	− 26·3	143·1	− 5·8		
20664	·383	5·6	140·9	+16·5	1	5
04	12·361	− 26·2	130·2	− 5·8		
20665	·978	79·4	53·7	+ 9·0	0	26
04	13·417	− 26·2	116·3	− 5·7		
20665	·906	77·9	52·9	+ 8·4	2	21
04	14·329	− 26·2	104·3	− 5·6		
20665	·805	74·3	52·8	+ 9·1	0	8
04	15·367	·	·	·	0	0
04	16·534	·	·	·	0	0
04	17·432	·	·	·	0	0
04	18·320	·	·	·	0	0
04	19·342	·	·	·	0	0
04	20·358	− 25·7	24·7	− 5·1		
20666	·586	97·4	348·9	− 8·4	2	23
051479	·936	98·5	315·0	− 9·7	0	10
04	21·313	− 25·6	12·0	− 5·0		
20666	·385	99·8	349·6	− 8·3	7	61
04	22·450	− 25·5	357·0	− 4·9		
20666	·127	121·7	350·8	− 8·7	13	55
04	23·412	− 25·3	344·3	− 4·8		
20666	·127	236·8	350·4	− 8·7	4	36
04	24·329	− 25·2	332·2	− 4·8		
20666	·327	256·6	350·9	− 8·7	1	31
20667	·930	102·6	263·6	−13·5	0	17

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
04	25·313	− 25·1	319·2	− 4·7		
20666	·523	259·9	350·5	− 9·2	2	35
20667	·862	103·8	259·7	−14·2	0	11
04	26·321	− 25·0	305·9	− 4·6		
20666	·737	261·9	353·3	− 9·1	1	10
04	27·314	− 24·8	292·7	− 4·5		
20666	·873	261·3	353·6	− 9·8	0	7
04	28·522	·	·	·	0	0
04	29·332	·	·	·	0	0
04	30·330	·	·	·	0	0
05	1·324	− 24·1	239·8	− 4·1		
011480	·844	45·1	194·0	+33·6	0	5
05	2·339	·	·	·	0	0
05	3·579	·	·	·	0	0
05	4·323	− 23·6	200·1	− 3·8		
20668	·337	82·7	180·7	− 1·0	0	24
05	5·344	− 23·4	186·6	− 3·7		
20668	·094	67·9	181·7	− 1·6	10	38
05	6·404	− 23·1	172·6	− 3·6		
20668	·187	280·0	183·1	− 1·6	5	26
05	7·397	− 22·9	159·5	− 3·5		
20668	·447	273·6	185·9	− 1·4	7	26
05	8·348	− 22·7	146·9	− 3·3		
20668	·634	271·0	186·1	− 1·8	3	34
05	9·390	− 22·5	133·1	− 3·2		
20668	·830	270·7	189·0	− 1·3	2	14
05	10·378	− 22·2	120·1	− 3·1		
20668	·935	270·2	189·0	− 0·9	0	10
05	11·363	− 22·0	107·0	− 3·0		
20668	·991	269·3	188·9	− 1·2	0	25
05	12·328	·	·	·	0	0
05	13·325	·	·	·	0	0
05	14·336	− 21·2	67·7	− 2·7		
20669	·369	40·1	53·6	+13·7	0	7
05	15·333	− 20·9	54·5	− 2·6		
20669	·289	2·8	53·7	+14·1	1	22
α1480	·256	33·1	46·4	+ 9·8	0	4
05	16·277	− 20·7	42·0	− 2·5		
20669	·359	322·0	55·1	+14·0	1	18
20670	·747	79·2	354·7	+ 6·4	1	17

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
05	17·327	− 20·4	28·2	− 2·3		
20669	·530	301·8	55·7	+14·1	0	6
20670	·552	74·8	355·9	+ 6·3	6	45
05	18·338	− 20·1	14·8	− 2·2		
20670	·344	65·9	356·5	+ 5·9	10	46
05	19·392	− 19·7	0·8	− 2·1		
20670	·193	33·3	354·7	+ 7·2	1	15
05	20·338	− 19·5	348·3	− 2·0		
20670	·195	325·3	354·7	+ 7·2	1	9
05	21·383	− 19·1	334·5	− 1·9		
20670	·367	293·7	354·2	+ 6·7	0	4
05	22·410	− 18·8	320·9	− 1·7		
20671	·702	281·2	4·7	+ 6·6	1	8
20670	·559	284·6	353·7	+ 6·6	1	10
20672	·249	341·1	325·6	+11·8	3	21
05	23·337	− 18·5	308·7	− 1·6		
20671	·857	279·3	6·9	+ 7·1	0	9
20672	·371	310·3	325·4	+12·2	10	66
05	24·324	− 18·2	295·6	− 1·5		
20672	·522	296·2	324·1	+11·9	9	36
05	25·320	− 17·8	282·4	− 1·4		
20672	·706	289·2	325·3	+12·4	4	35
05	26·605	− 17·4	265·4	− 1·3		
20673	·992	84·2	182·9	+ 5·6	0	35
20672	·897	284·4	327·9	+12·3	0	2
05	27·339	− 17·2	255·7	− 1·2		
20673	·959	84·2	182·6	+ 5·3	16	68
05	28·379	− 16·8	241·9	− 1·0		
20673	·860	83·4	183·1	+ 5·1	18	76
05	29·431	− 16·4	228·0	− 0·9		
20673	·709	81·6	183·5	+ 5·3	13	70
05	30·328	− 16·1	216·1	− 0·8		
20673	·546	78·3	183·8	+ 5·7	17	70
05	31·337	− 15·7	202·8	− 0·7		
20673	·338	71·1	184·1	+ 5·6	15	57
06	1·362	− 15·3	189·2	− 0·6		
20673	·144	36·3	184·3	+ 6·1	9	41
06	2·343	− 15·0	176·2	− 0·4		
20673	·191	307·8	184·9	+ 6·2	5	20
06	3·417	− 14·5	162·0	− 0·3		
20673	·409	286·3	185·2	+ 6·3	5	19
06	4·555	− 14·1	147·0	− 0·2		
20673	·630	280·6	185·4	+ 6·5	1	15

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
06	5·636	·	·	·	0	0
06	6·355	·	·	·	0	0
06	7·326	−13·0	110·3	+ 0·2		
011481	·884	51·8	54·4	+33·2	0	12
06	8·316	·	·	·	0	0
06	9·330	−12·2	83·8	+ 0·4		
20674	·956	65·4	12·6	+23·6	0	12
06	10·350	−11·8	70·3	+ 0·5		
20674	·862	61·7	14·0	+24·4	0	2
06	11·438	−11·3	55·9	+ 0·7		
20675	·617	81·8	18·2	+ 5·5	0	9
20674	·744	56·9	12·9	+24·4	0	19
06	12·337	−10·9	44·0	+ 0·8		
20675	·420	77·8	19·7	+ 5·8	1	8
20674	·614	48·8	13·6	+24·4	0	9
06	13·549	−10·4	27·9	+ 0·9		
20675	·179	64·5	18·7	+ 5·3	5	24
20676	·958	62·5	316·5	+26·5	0	3
06	14·321	−10·1	17·7	+ 1·0		
20675	·082	348·6	18·6	+ 5·5	11	50
20676	·895	60·7	317·3	+26·4	0	25
06	15·324	− 9·7	4·4	+ 1·1		
20675	·249	287·4	18·2	+ 5·3	4	27
20676	·784	56·3	317·8	+26·5	6	68
06	16·326	− 9·2	351·2	+ 1·3		
20675	·473	278·9	19·0	+ 5·3	0	8
20676	·678	50·2	315·7	+26·6	15	88
06	17·344	− 8·8	337·7	+ 1·4		
20676	·552	38·4	315·2	+26·8	2	34
06	18·349	− 8·4	324·4	+ 1·5		
20676	·447	17·4	315·9	+26·6	4	34
20677	·540	37·3	303·0	+26·7	4	18
06	19·339	− 7·9	311·3	+ 1·6		
20676	·435	354·7	313·9	+27·2	2	21
20677	·438	16·1	303·5	+26·4	5	39
06	20·369	− 7·5	297·7	+ 1·7		
011482	·954	274·1	10·0	+ 4·4	0	11
20676	·493	330·5	313·4	+26·9	0	8
20677	·431	350·2	302·4	+26·7	10	47
021482	·709	66·6	254·8	+17·6	0	5
06	21·393	− 7·0	284·1	+ 1·8		
20677	·509	328·2	301·6	+27·3	0	15
06	22·327	− 6·6	271·7	+ 2·0		
20677	·612	314·1	301·1	+26·8	0	4
06	23·441	− 6·1	257·0	+ 2·1		
031482	·907	84·1	192·0	+ 6·2	0	8

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1964		°	°	°		
06	24·328	− 5·7	245·2	+ 2·2		
21482	·216	128·9	235·6	− 5·6	0	7
06	25·327	·	·	·	0	0
06	26·333	·	·	·	0	0
06	27·312	·	·	·	0	0
06	28·385	·	·	·	0	0
06	29·332	− 3·4	179·0	+ 2·8		
20678	·948	95·6	108·1	− 4·5	0	22
06	30·331	− 3·0	165·8	+ 2·9		
20678	·835	96·6	109·8	− 3·9	6	23
07	1·416	− 2·5	151·4	+ 3·0		
20678	·656	100·1	111·2	− 4·3	0	6
07	2·422	·	·	·	0	0
07	3·335	− 1·6	126·0	+ 3·2		
20679	·971	57·8	50·7	+32·0	0	10
07	4·381	− 1·1	112·2	+ 3·3		
20679	·893	57·1	51·7	+30·6	2	23
07	5·334	− 0·7	99·6	+ 3·4		
20679	·805	53·4	50·9	+30·9	4	21

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1964		°	°	°		
07	6·325	− 0·3	86·5	+ 3·5		
20679	·657	46·2	53·4	+29·9	0	8
07	7·530	·	·	·	0	0
07	8·630	·	·	·	0	0
07	9·357	·	·	·	0	0
07	10·332	·	·	·	0	0
07	11·425	·	·	·	0	0
07	12·367	·	·	·	0	0
07	13·329	·	·	·	0	0
07	14·351	+ 3·4	340·2	+ 4·3		
20680	·735	55·9	297·1	+27·4	5	31
07	15·542	+ 3·9	324·5	+ 4·4		
20680	·558	45·6	298·0	+26·9	17	74
07	16·357	+ 4·3	313·7	+ 4·5		
20680	·470	34·4	296·4	+27·0	3	29
07	17·444	+ 4·7	299·3	+ 4·6		
20680	·397	11·1	294·4	+27·4	4	25
07	18·327	+ 5·1	287·6	+ 4·7		
20680	·403	339·7	296·6	+26·8	1	5

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
07	19·423	+ 5·6	273·1	+ 4·8		
/α1483	·506	323·4	293·1	+28·4	0	5
07	20·436	·	·	·	0	0
07	21·336	·	·	·	0	0
07	22·329	·	·	·	0	0
07	23·331	·	·	·	0	0
07	24·333	·	·	·	0	0
07	25·335	·	·	·	0	0
07	26·305	·	·	·	0	0
07	27·435	·	·	·	0	0
07	28·331	·	·	·	0	0
07	29·615	·	·	·	0	0
07	30·433	·	·	·	0	0
07	31·327	·	·	·	0	0
08	1·333	+11·0	102·3	+ 5·8		
20681	·764	289·8	151·6	+18·8	3	22
08	2·415	+11·4	88·0	+ 5·9		
20681	·886	289·0	150·6	+19·6	4	34
20682	·501	275·1	118·1	+ 7·7	2	8
08	3·327	+11·8	76·0	+ 6·0		
20681	·961	287·7	150·8	+18·6	0	23
20682	·691	274·3	119·8	+ 7·3	1	13
08	4·426	+12·2	61·4	+ 6·1		
20682	·837	275·2	118·4	+ 7·7	2	11
08	5·465	+12·6	47·7	+ 6·1		
20682	·966	275·5	122·9	+ 6·9	0	13
08	6·340	+12·9	36·1	+ 6·2		
20682	·998	277·1	122·9	+ 7·4	0	14
08	7·360	+13·3	22·7	+ 6·3		
α1483	·698	63·3	340·3	+22·8	0	12
08	8·320	·	·	·	0	0
08	9·413	·	·	·	0	0
08	10·338	·	·	·	0	0
08	11·433	+14·8	328·8	+ 6·5		
20683	·920	82·3	261·5	+ 9·6	2	27
08	12·650	+15·2	312·7	+ 6·6		
20684	·533	303·9	341·3	+23·0	12	45
20683	·766	82·7	262·4	+ 9·8	0	13
08	13·322	+15·5	303·8	+ 6·6		
20684	·637	297·6	341·3	+22·4	9	86
20683	·648	82·7	263·3	+ 9·7	0	7
08	14·320	+15·8	290·6	+ 6·6		
20684	·779	294·1	340·9	+22·8	76	328
20683	·502	86·7	260·4	+ 7·4	5	29

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Pos. Ang.	Position Long.	Lat.	Area Umb.	Whole Spots
1964		°	°	°		
08	15·319	+16·2	277·4	+ 6·7		
20684	·902	292·3	342·2	+23·0	43	336
20683	·294	84·6	260·3	+ 8·0	9	76
08	16·416	+16·5	262·9	+ 6·7		
20684	·977	292·6	342·1	+23·4	37	286
20683	·039	51·1	261·3	+ 8·0	28	105
08	17·546	+16·9	248·0	+ 6·8		
20683	·251	276·3	262·5	+ 8·1	4	33
08	18·332	+17·2	237·6	+ 6·8		
20683	·466	275·2	265·4	+ 8·5	1	12
08	19·205	+17·4	226·1	+ 6·9		
20683	·637	274·6	265·8	+ 8·2	3	14
08	20·333	+17·8	211·2	+ 6·9		
20683	·815	275·0	266·0	+ 8·1	4	20
08	21·658	+18·2	193·7	+ 7·0		
20683	·954	276·4	266·6	+ 8·2	3	23
08	22·389	·	·	·	0	0
08	23·384	·	·	·	0	0
08	24·327	·	·	·	0	0
08	25·322	·	·	·	0	0
08	26·330	·	·	·	0	0
08	27·336	·	·	·	0	0
08	28·436	·	·	·	0	0
08	29·323	·	·	·	0	0
08	30·374	·	·	·	0	0
08	31·329	+21·0	65·9	+ 7·2		
011484	·985	67·1	343·9	+23·7	0	6
09	1·329	+21·2	52·7	+ 7·2		
20685	·938	69·5	342·0	+21·7	0	16
09	2·330	+21·5	39·4	+ 7·2		
20685	·848	69·4	341·3	+21·3	7	33
09	3·320	+21·7	26·4	+ 7·2		
20685	·714	67·5	341·6	+21·0	1	13
09	4·336	·	·	·	0	0
09	5·432	·	·	·	0	0
09	6·427	·	·	·	0	0
09	7·305	+22·6	333·7	+ 7·3		
20686	·544	344·8	344·3	+38·7	0	4

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1964		°	°	°		
09	8·664	+22·9	315·8	+ 7·3		
20686	·664	324·0	345·7	+38·7	1	24
09	9·456	+23·1	305·3	+ 7·3		
20686	·734	317·2	344·6	+38·2	4	37
09	10·332	+23·3	293·8	+ 7·3		
20686	·817	313·0	343·5	+38·7	6	37
09	11·357	+23·5	280·2	+ 7·2		
20686	·906	309·3	343·6	+38·4	5	81
09	12·326	+23·6	267·4	+ 7·2		
20686	·967	308·3	343·9	+38·8	7	106
20687	·481	270·5	296·3	+ 6·6	1	11
09	13·356	+23·8	253·8	+ 7·2		
20686	·993	309·8	340·4	+40·2	0	8
20687	·698	272·3	298·3	+ 6·7	12	68
09	14·344	+24·0	240·8	+ 7·2		
20687	·845	273·6	298·7	+ 6·9	4	34
09	15·317	+24·2	228·0	+ 7·2		
20687	·957	277·0	301·6	+ 8·8	0	19
09	16·407	·	·	·	0	0
09	17·333	·	·	·	0	0
09	18·324	·	·	·	0	0
09	19·381	·	·	·	0	0
09	20·346	·	·	·	0	0
09	21·333	·	·	·	0	0
09	22·331	·	·	·	0	0
09	23·330	·	·	·	0	0
09	24·331	·	·	·	0	0
09	25·331	·	·	·	0	0
09	26·350	·	·	·	0	0
09	27·376	+25·8	68·8	+ 6·9		
01/14485	·864	283·1	129·0	+14·7	0	7
09	28·368	·	·	·	0	0
09	29·351	·	·	·	0	0
09	30·366	·	·	·	0	0
10	1·391	+26·1	15·8	+ 6·7		
20688	·895	291·9	79·6	+22·6	0	23
20689	·453	237·8	38·4	− 7·7	6	23
10	2·306	+26·1	3·7	+ 6·6		
20688	·963	291·3	79·2	+22·3	0	14
20689	·614	248·3	38·7	− 7·6	3	22
10	3·390	+26·2	349·4	+ 6·6		
20689	·825	256·4	43·1	− 7·3	0	4

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures		Position		Area	
	Rad. Dist.	Pos. Ang.	Long.	Lat.	Umb.	Whole Spots
1964		°	°	°		
10	4·380	+26·2	336·4	+ 6·5		
20689	·925	259·7	42·5	− 6·9	0	3
10	5·395	·	·	·	0	0
10	6·356	+26·3	310·3	+ 6·4		
20690	·657	301·5	348·4	+25·1	10	45
10	7·633	+26·3	293·4	+ 6·3		
20690	·819	295·3	347·6	+24·3	13	70
20691	·469	230·2	314·9	−11·4	2	20
10	8·445	+26·3	282·7	+ 6·3		
20690	·893	294·3	346·0	+24·5	26	161
20691	·587	239·7	313·8	−11·8	0	2
10	9·369	+26·4	270·5	+ 6·2		
20690	·961	293·9	345·4	+24·6	11	127
10	10·349	+26·4	257·6	+ 6·2		
20690	·995	294·9	343·7	+25·3	0	19
10	11·378	·	·	·	0	0
10	12·422	·	·	·	0	0
10	13·342	+26·3	218·1	+ 6·0		
20692	·950	84·5	146·0	+ 7·1	0	6
10	14·299	+26·3	205·5	+ 5·9		
20692	·833	84·1	148·9	+ 8·2	0	2
10	15·393	·	·	·	0	0
10	16·365	·	·	·	0	0
10	17·368	·	·	·	0	0
10	18·377	+26·1	151·7	+ 5·6		
20693	·402	0·1	151·7	+29·2	7	29
10	19·436	+26·0	137·7	+ 5·5		
20693	·448	332·9	151·2	+28·7	5	42
10	20·323	+26·0	126·0	+ 5·4		
20693	·539	321·6	148·7	+29·9	5	24
10	21·308	·	·	·	0	0
10	22·375	+25·8	99·0	+ 5·2		
20693	·809	302·1	150·2	+28·7	0	8
10	23·332	·	·	·	0	0
10	24·294	·	·	·	0	0
10	25·413	+25·5	58·9	+ 5·0		
20694	·945	68·1	347·8	+22·3	3	33
10	26·310	+25·4	47·1	+ 4·9		
20694	·887	66·5	345·3	+23·0	0	11

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
10	27·403	+ 25·2	32·7	+ 4·8		
011486	·297	203·9	39·7	−11·0	0	9
20694	·770	63·9	344·2	+23·0	0	17
10	28·306	·	·	·	0	0
10	29·314	·	·	·	0	0
10	30·380	+ 24·8	353·4	+ 4·5		
011487	·378	322·3	7·7	+21·7	2	10
021487	·349	22·6	345·1	+ 23·2	1	10
10	31·395	+ 24·6	340·0	+ 4·4		
20695	·421	117·4	318·0	− 7·1	3	28
11	1·438	+ 24·5	326·3	+ 4·3		
20695	·233	146·7	318·9	− 6·8	10	39
11	2·475	+ 24·3	312·6	+ 4·2		
20695	·233	217·2	320·7	− 6·5	4	15
11	3·430	+ 24·1	300·0	+ 4·1		
20695	·409	244·1	321·7	− 6·5	4	14
11	4·293	·	·	·	0	0
11	5·500	·	·	·	0	0
11	6·388	+ 23·5	261·0	+ 3·8		
20696	·843	53·1	208·0	+ 32·7	0	6
11	7·487	·	·	·	0	0
11	8·461	+ 23·1	233·7	+ 3·5		
20696	·591	36·9	209·2	+ 31·3	0	8
11	9·400	·	·	·	0	0
11	10·409	+ 22·6	208·0	+ 3·3		
031487	·878	52·5	151·0	+ 34·1	0	13
11	11·578	·	·	·	0	0
11	12·600	+ 22·1	179·1	+ 3·1		
20697	·445	358·5	179·9	+ 29·4	4	20
11	13·281	+ 21·9	170·1	+ 3·0		
20697	·478	345·2	178·2	+30·3	2	11
11	14·311	+ 21·6	156·6	+ 2·9		
20697	·589	323·2	180·6	+ 30·6	2	20
11	15·465	+ 21·3	141·4	+ 2·7		
20697	·725	310·5	180·8	+ 30·1	2	16
11	16·393	+ 21·0	129·1	+ 2·6		
20697	·857	304·2	184·0	+30·2	0	11
20698	·300	338·5	135·7	+ 18·7	5	39

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
11	17·385	+ 20·8	116·0	+ 2·5		
20698	·452	308·5	137·8	+18·6	24	102
11	18·333	+ 20·5	103·5	+ 2·4		
20699	·928	258·6	170·6	− 9·5	3	31
20698	·622	297·2	139·0	+18·4	20	94
11	19·309	+ 20·2	90·7	+ 2·3		
20699	·993	259·6	173·0	−10·0	0	16
20698	·778	292·3	139·9	+18·6	19	101
11	20·367	+ 19·8	76·7	+ 2·1		
20698	·900	290·1	139·8	+18·9	13	101
20700	·836	313·3	125·6	+36·3	0	34
11	21·333	+ 19·5	64·0	+ 2·0		
20698	·971	288·8	139·9	+18·8	4	52
20700	·907	309·0	124·1	+35·7	2	20
11	22·323	+ 19·2	50·9	+ 1·9		
20700	·969	307·2	124·2	+36·4	0	24
11	23·295	·	·	·	0	0
11	24·295	·	·	·	0	0
11	25·441	+ 18·2	9·8	+ 1·5		
01 1487	·630	305·5	43·5	+22·6	0	6
11	26·289	·	·	·	0	0
11	27·464	·	·	·	0	0
11	28·436	+ 17·1	330·4	+ 1·1		
20701	·774	289·5	19·5	+15·7	0	9
11	29·285	+ 16·8	319·2	+ 1·0		
20701	·882	287·1	19·9	+15·5	0	12
11	30·385	·	·	·	0	0
12	1·414	·	·	·	0	0
12	2·399	·	·	·	0	0
12	3·440	·	·	·	0	0
12	4·303	+ 14·8	253·1	+ 0·4		
01 1488	·896	49·0	196·3	+36·2	2	17
12	5·288	·	·	·	0	0
12	6·301	+ 14·0	226·7	+ 0·1		
20702	·846	54·4	174·7	+29·5	0	16
02 1488	·926	53·4	163·9	+33·5	0	10
12	7·317	+ 13·6	213·3	0·0		
03 1488	·638	43·7	183·7	+27·4	0	4
20702	·729	47·3	175·5	+29·6	0	3
12	8·384	+ 13·1	199·3	− 0·1		
20702	·627	38·6	172·8	+29·1	0	12

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
12	9·317	·	·	·	0	0
12	10·281	+ 12·3	174·3	− 0·4		
20703	·979	97·4	96·2	− 7·3	24	102
12	11·394	+ 11·8	159·6	− 0·5		
20703	·891	97·5	97·1	− 6·9	20	80
12	12·309	+ 11·4	147·6	− 0·6		
20703	·776	98·0	97·1	− 6·6	17	75
12	13·370	+ 10·9	133·6	− 0·8		
20703	·600	100·9	97·4	− 7·1	11	43
12	14·439	+ 10·4	119·5	− 0·9		
20703	·395	106·2	97·2	− 7·0	9	29
12	15·295	+ 10·1	108·2	− 1·0		
20703	·211	121·8	97·9	− 7·2	2	30
12	16·350	+ 9·6	94·3	− 1·2		
20704	·664	53·3	59·3	+22·4	2	37
20705	·939	99·3	24·7	− 9·2	0	25
12	17·285	+ 9·1	82·0	− 1·3		
20704	·546	43·5	58·2	+22·1	2	16
20705	·863	100·6	22·9	− 9·6	8	35
12	18·535	+ 8·6	65·5	− 1·4		
20704	·428	15·5	58·5	+22·9	1	17
20705	·693	102·6	22·4	− 9·6	3	36
20706	·980	54·8	350·7	+34·0	56	313
1	·961	54·1	356·2	+33·8	39	145
12	19·299	+ 8·2	55·5	− 1·5		
20707	·667	279·8	96·6	+ 5·3	4	18
20705	·531	106·1	24·5	− 9·6	2	22
20706	·934	52·5	352·5	+33·8	45	213
1	·917	51·9	355·6	+33·6	34	131
12	20·287	+ 7·7	42·5	− 1·7		
20707	·834	278·1	98·3	+ 5·8	5	43
20705	·332	116·0	24·9	− 9·8	0	14
20706	·857	48·0	352·6	+33·8	42	195
1	·842	47·3	354·7	+33·6	27	151
12	21·286	+ 7·3	29·3	− 1·8		
20707	·926	275·7	96·7	+ 4·6	0	8
20705	·163	160·7	26·2	−10·4	8	31
20706	·767	41·5	351·9	+33·5	48	202
1	·753	40·4	353·7	+33·4	33	163
12	22·293	+ 6·8	16·0	− 1·9		
04 1488	·882	279·6	77·1	+ 7·5	0	4
20705	·234	229·2	26·3	−10·5	0	16
20706	·683	31·6	350·6	+33·7	31	180
1	·665	29·5	353·0	+33·5	25	136
12	23·285	+ 6·3	3·0	− 2·0		
20706	·607	17·4	350·5	+33·3	34	153
1	·598	15·3	352·2	+33·1	27	125
12	24·285	+ 5·8	349·8	− 2·1		
20706	·586	359·8	349·9	+33·6	29	165
1	·585	357·8	351·4	+33·5	23	140

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

U.T. and Group No.	Measures Rad. Dist.	Measures Pos. Ang.	Position Long.	Position Lat.	Area Umb.	Area Whole Spots
1964		°	°	°		
12	25·291	+ 5·4	336·5	− 2·3		
20706	·621	342·0	349·9	+33·8	30	151
1	·624	340·8	350·7	+33·7	29	138
12	26·439	+ 4·8	321·4	− 2·4		
011489	·918	259·4	27·9	−10·7	0	11
20706	·707	326·2	349·6	+33·7	25	115
1	·707	326·2	349·6	+33·7	25	115
12	27·309	+ 4·4	310·0	− 2·5		
021489	·961	258·4	23·8	−11·8	0	23
20706	·787	317·8	349·2	+33·6	27	135
1	·787	317·8	349·2	+33·6	27	135
20708	·799	88·4	257·2	− 0·3	2	14
12	28·387	+ 3·9	295·8	− 2·6		
20706	·881	311·6	348·4	+34·2	14	108
12	28·387	*continued*				
1	·881	311·6	348·4	+34·2	14	108
20709	·698	52·8	258·8	+22·7	15	101
20708	·611	86·7	258·3	− 0·1	3	18
12	29·288	+ 3·4	283·9	− 2·7		
20706	·943	307·2	347·9	+33·5	28	102
1	·943	307·2	347·9	+33·5	28	102
031489	·258	65·0	270·4	+ 3·6	1	14
20709	·573	42·5	259·3	+22·4	14	103
20708	·431	85·2	258·6	− 0·4	0	2
12	30·299	+ 2·9	270·6	− 2·9		
20706	·984	304·9	345·8	+33·5	11	104
1	·984	304·9	345·8	+33·5	11	104
20709	·464	22·6	259·5	+22·4	1	31
12	31·414	+ 2·4	255·9	− 3·0		
20709	·431	356·0	257·8	+22·4	36	111

NOTES ON SUNSPOT GROUPS 1964

Group 20637.	Jan.	2 – 3	One or two tiny spots.
Group 20638.	Jan.	4 – 5	One or two tiny spots.
Group 20639.	Jan.	5 – 9	A few small spots.
Group 20640.	Jan.	6 – 14	A small spot, not seen on January 10; from January 12 to 14 there are two spots.
Group 20641.	Jan.	13 – 16	A group of small spots.
Group 20642.	Jan.	14 – 17	Two small spots from January 14 to 16; a tiny spot on January 17.
Group 20643.	Jan.	18 – 19	A tiny spot.
Group 20644.	Jan	19 – 30	A diminishing regular spot with occasional companions.
Group 20645.	Jan.	20 – 22	A small spot.
Group 20646.	Jan.	28 – 31	A cluster of small spots developing into a bi-polar group on January 29; the area is increasing as the group passes round the west limb.
Group 20647.	Feb.	7 – 11	A tiny spot on February 7; two small spots on the other days.
Group 20648.	Feb.	15 – 26	A small spot diminishing in area.
Group 20649.	Feb.	15 – 17	A tiny spot.
Group 20650.	Feb.	18 – 24	A few tiny spots which develop into a stream; on February 24 a cluster of small spots remains.
Group 20651.	Feb.	21 – Mar. 1	A few tiny spots rapidly developing into a complicated stream. The leader is the most stable component and alone survives at the west limb.
Group 20652.	Feb.	27 – 29	A tiny spot on February 27; a few small spots on the other two days.
Group 20653.	Feb.	28 – Mar. 6	One or two tiny spots, not seen on March 2.
Group 20654.	Feb.	29 – Mar. 2	A tiny spot.
Group 20655.	Mar.	7 – 8	A tiny spot.
Group 20656.	Mar.	11 – 14	A tiny spot, developing into a cluster of small spots.
Group 20657.	Mar.	11 – 16	A small spot with following companions; on March 16 only two small spots remain.
Group 20658.	Mar.	12 – 13	A pair of tiny spots.
Group 20659.	Mar.	13 – 17	A few tiny spots rapidly developing into a bi-polar group.
Group 20660.	Mar.	16 – 28	Return of Group 20651. A diminishing regular spot.
Group 20661.	Mar.	21 – 26	A short-lived bi-polar group.
Group 20662.	Mar.	27 – 29	A small spot on March 27; a cluster of tiny spots on the other days.
Group 20663.	Apr.	1 – 2	One or two tiny spots.
Group 20664.	Apr.	6 – 11	A small spot.
Group 20665.	Apr.	12 – 14	A tiny spot.
Group 20666.	Apr.	20 – 27	A stream of small spots until April 26, after which it becomes a small cluster.
Group 20667.	Apr.	24 – 25	A few tiny spots.
Group 20668.	May	4 – 11	A stream of small spots, of which only one remains at the west limb.

Group 20669.	May 14 – 17	A stream of tiny spots.
Group 20670.	May 16 – 22	A cluster of tiny spots until May 20, after which only one remains.
Group 20671.	May 22 – 23	One or two tiny spots.
Group 20672.	May 22 – 26	A pair of small spots, of which only one remains on May 24. This subsequently becomes a cluster of tiny spots.
Group 20673.	May 26 – June 4	A regular spot with maximum area on May 28.
Group 20674.	June 9 – 12	A tiny spot, except on June 11 when there are several tiny spots.
Group 20675.	June 11 – 16	A pair of tiny spots, developing into a small stream.
Group 20676.	June 13 – 20	A tiny spot, which develops into a small stream and dies out just past the central meridian.
Group 20677.	June 18 – 22	A pair of small spots with companions until June 21, when only one spot remains.
Group 20678.	June 29 – July 1	A small spot.
Group 20679.	July 3 – 6	Two or three tiny spots.
Group 20680.	July 14 – 18	A small spot with following companions until July 17; after this only the leader remains.
Group 20681.	Aug. 1 – 3	Two tiny spots.
Group 20682.	Aug. 2 – 6	Variable scattered spots.
Group 20683.	Aug. 11 – 21	A pair of tiny spots on August 11 and 12. On August 13 only a single spot is seen, but the group then develops into a short-lived stream, of which a single spot remains after August 18.
Group 20684.	Aug. 12 – 16	A cluster of small spots, with maximum area on August 15.
Group 20685.	Sept. 1 – 3	Return of Group 20684. A small spot, with a companion on September 2.
Group 20686.	Sept. 7 – 13	A few small spots.
Group 20687.	Sept. 12 – 15	A cluster of tiny spots.
Group 20688.	Oct. 1 – 2	A pair of tiny spots.
Group 20689.	Oct. 1 – 4	A few tiny spots, of which only one remains from October 3.
Group 20690.	Oct. 6 – 10	A stream of small spots.
Group 20691.	Oct. 7 – 8	Three small spots on October 7; a single spot on October 8.
Group 20692.	Oct. 13 – 14	One or two tiny spots.
Group 20693.	Oct. 18 – 22	A few tiny spots, not seen on October 21.
Group 20694.	Oct. 25 – 27	A few tiny spots.
Group 20695.	Oct. 31 – Nov. 3	A small spot with following companions on October 31 and November 1.
Group 20696.	Nov. 6 – 8	A tiny spot, not seen on November 7.
Group 20697.	Nov. 12 – 16	A pair of tiny spots, of which only the leader remains on November 16.
Group 20698.	Nov. 16 – 21	A stream of small spots, of which the leader becomes regular in outline on November 17.
Group 20699.	Nov. 18 – 19	One or two tiny spots.
Group 20700.	Nov. 20 – 22	A pair of tiny spots.

Group 20701.	Nov. 28 – 29	A tiny spot.
Group 20702.	Dec. 6 – 8	Three tiny spots on December 6 and 8; a single spot on December 7.
Group 20703.	Dec. 10 – 15	A small spot, with occasional companions.
Group 20704.	Dec. 16 – 18	A few tiny spots.
Group 20705.	Dec. 16 – 22	A stream of tiny spots.
Group 20706.	Dec. 18 – 30	A regular spot, with a following companion until December 25.
Group 20707.	Dec. 19 – 21	One or two small spots.
Group 20708.	Dec. 27 – 29	A small spot.
Group 20709.	Dec. 28 – Jan. 6	A diminishing bi-polar group. On December 31 there is a renewal of activity and the leading component coalesces to form a regular spot by January 2. The follower breaks up and is dying out as it passes round the west limb.

GENERAL CATALOGUE OF GROUPS OF SUNSPOTS FOR THE YEAR 1964

Groups of sunspots, lasting for two or more days, are numbered in the *first* column in continuation of the group numbers given for 1963. Groups seen on one day only are not included in this catalogue but are given with a distinctive numeration in a following table on p. 131.

The *second* column gives the U.T. of the central meridian passage of each group as deduced from its mean longitude (given in the *tenth* column). For those groups which are in existence at the time of the central meridian passage of their longitude, the time is given to $0^d{\cdot}01$, corresponding to $0°{\cdot}13$ of solar longitude. In other cases, in which groups disappear before or appear after the central meridian, the deduced time is given to $0^d{\cdot}1$.

The *third* column gives the duration of each group in days. Intermittent groups, *i.e.* groups which are not seen upon the photographs of every day between their first and last appearances, are indicated by a fraction, the numerator of which represents the number of days on which they are actually observed, the denominator being the number of days covering the extreme limits of observation.

The *fifth* and *seventh* columns, headed 'Longitude from central meridian', give, for the days on which each group was first and last seen respectively, the heliographic longitude from the meridian passing through the centre of the Sun's disk at the time of observation, longitudes west of the centre being reckoned as positive.

The mean areas for umbrae and whole spots entered in the *eighth* and *ninth* columns are corrected for the effect of foreshortening and are expressed in millionths of the Sun's visible hemisphere.

The *tenth* and *eleventh* columns give the mean heliographic position of the group in longitude and latitude respectively.

When a group is 80° or more from the Sun's central meridian, or in cases of close proximity to the Sun's limb when only part of the group is visible, the measures for that day are not included in deriving the mean area or the mean longitude and latitude of the group.

The *twelfth* column gives reference to recurrent groups. The numeration is in continuation of the recurrent series given in Ledger I of the *Greenwich Photo-Heliographic Results* for 1955; bracketed numbers indicate the order of a group in the series.

With reference to the identification of recurrent groups, it should be noted that longitudes are based on the ephemeris given in the *Astronomical Ephemeris*, assuming a solar rotation period constant at all latitudes. After an interval of one rotation, recurring groups will, therefore, show in general—apart from any proper motion they may have of their own—apparent drifts in longitude varying in amount according to their respective latitudes. The following table, derived from the formula $\xi = 14°{\cdot}37 - 2°{\cdot}60 \sin^2\phi$, gives the apparent drift in longitude appropriate to different latitudes after an interval of 27 days, a drift forwards corresponding to an increase in heliographic longitude.

Latitude	Drift *forwards*	Latitude	Drift *backwards*
0°	5°	20°	3°
5°	4·5	25°	7·5
10°	3	30°	12·5
15°	0·5	35°	18

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.M.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbræ	Whole Spots	Long.	Lat.	
	1964	d	1964	°	1964	°			°	°	
20637	Jan. 3·7	2	Jan. 2	−16	Jan. 3	− 7	0	8	3·9	+ 8·2	
8	8·4	2	4	−54	5	−38	2	10	301·0	− 7·5	
9	8·40	5	5	−39	9	+12	4	21	301·5	− 6·8	
20640	8·29	8/9	6	−29	14	+79	1	11	302·9	− 0·7	
1	15·25	4	13	−25	16	+19	2	17	211·3	+10·3	
2	14·54	4	14	− 5	17	+41	4	26	220·6	+12·3	
3	15·5	2	18	+38	19	+51	2	8	208·5	+10·4	
4	25·30	12	19	−80	30	+68	23	123	78·9	+ 8·8	
20645	26·2	3	20	−78	22	−51	1	27	67·4	+ 9·0	
6	24·8	4	28	+46	31	+81	65	348	84·9	− 3·0	
7	Feb. 5·6	5	Feb. 7	+22	Feb. 11	+78	3	26	289·7	− 8·5	
8	20·51	12	15	−67	26	+80	6	30	93·9	− 4·4	
9	21·3	3	15	−77	17	−52	0	11	83·1	+ 9·2	
20650	21·60	7	18	−47	24	+38	6	51	79·5	+ 8·9	
1	24·42	10	21	−41	Mar. 1	+82	24	155	42·3	+ 8·2	1949 (1)
2	24·0	3	27	+46	Feb. 29	+70	4	44	48·5	+ 1·3	
3	Mar. 1·28	7/8	28	−29	Mar. 6	+70	0	7	325·2	+ 6·3	
4	3·1	3	29	−37	2	− 9	0	3	301·8	− 7·7	
20655	7·99	2	Mar. 7	− 8	8	+ 6	0	4	236·7	−10·0	
6	8·0	4	11	+48	14	+82	6	41	237·3	− 3·9	
7	11·91	6	11	− 6	16	+57	9	65	185·1	+42·4	
8	17·9	2	12	−72	13	−58	0	18	105·9	−10·3	
9	11·2	5	13	+31	17	+83	25	153	194·8	+ 4·2	
20660	22·45	13	16	−80	28	+79	21	134	46·2	+10·0	1949 (2)
1	20·5	6	21	+12	26	+77	27	171	71·5	+ 9·5	
2	30·8	3	27	−46	29	−18	2	18	296·1	− 9·0	
3	Apr. 6·8	2	Apr. 1	−71	Apr. 2	−64	0	16	203·2	+13·0	
4	11·6	6	6	−68	11	− 2	3	20	140·1	+15·9	
20665	18·2	3	12	−77	14	−52	1	18	53·2	+ 8·9	
6	22·90	8	20	−36	27	+61	4	32	351·1	− 8·9	
7	29·7	2	24	−69	25	−60	0	14	261·7	−13·9	
8	May 5·46	8	May 4	−19	May 11	+82	4	25	185·1	− 1·4	
9	15·33	4	14	−14	17	+28	1	13	54·6	+14·0	
20670	19·84	7	16	−47	22	+33	3	21	355·0	+ 6·7	
1	19·0	2	22	+44	23	+58	1	9	5·8	+ 6·9	
2	22·0	5	22	+ 5	26	+63	5	32	325·7	+12·2	
3	June 1·75	10	26	−83	June 4	+38	11	48	184·2	+ 5·8	
4	14·7	4	June 9	−71	12	−30	0	11	13·3	+24·2	
20675	14·24	6	11	−38	16	+28	4	21	18·8	+ 5·5	
6	19·00	8	13	−71	20	+16	4	35	315·8	+26·7	
7	20·01	5	18	−21	22	+29	4	25	302·4	+26·8	
8	July 4·6	3	29	−71	July 1	−40	2	17	109·7	− 4·3	
9	8·9	4	July 3	−75	6	−33	2	16	51·7	+30·9	
20680	17·65	5	14	−43	18	+ 9	6	33	296·6	+27·1	
1	28·7	3	Aug. 1	+49	Aug. 3	+75	2	26	151·0	+19·1	
2	31·0	5	2	+30	6	+87	1	11	119·9	+ 7·4	
3	Aug. 16·39	11	11	−67	21	+73	5	33	263·3	+ 8·6	
4	10·5	5	12	+29	16	+79	35	216	341·6	+23·0	1950 (1)

GENERAL CATALOGUE OF SUNSPOTS

No. of Group	U.T. of C.N.P.	Duration	First Seen		Last Seen		Corrected Mean Area		Mean Position		Reference
			Date	Long. from C.M.	Date	Long. from C.M.	Umbrae	Whole Spots	Long.	Lat.	
	1964	d	1964	°	1964	°			°	°	
20685	Sept. 6·7	3	Sept. 1	−71	Sept. 3	−45	4	23	341·5	+21·2	1950 (2)
6	6·5	7	7	+11	13	+87	4	48	344·3	+38·6	
7	10·0	4	12	+29	15	+74	4	33	298·8	+ 7·3	
8	26·6	2	Oct. 1	+64	Oct. 2	+76	0	19	79·5	+22·5	
9	29·5	4	1	+23	4	+66	2	13	40·8	− 7·4	
20690	Oct. 3·6	5	6	+38	10	+86	15	101	346·9	+24·7	
1	6·0	2	7	+21	8	+31	1	11	314·4	−11·7	
2	18·7	2	13	−72	14	−57	0	4	147·5	+ 7·7	
3	18·5	4 / 5	18	0	22	+51	4	26	150·5	+29·2	
4	31·0	3	25	−71	27	−49	1	20	345·8	+22·8	
20695	Nov. 1·92	4	31	−22	Nov. 3	+22	5	24	319·9	− 6·8	
6	10·4	2 / 3	Nov. 6	−53	8	−24	0	7	208·7	+32·0	
7	12·5	5	12	+ 1	16	+55	2	16	180·8	+30·2	
8	15·7	6	16	+ 7	21	+76	14	82	138·8	+18·7	
9	13·2	2	18	+67	19	+82	3	31	170·6	− 9·6	
20700	16·7	3	20	+49	22	+73	1	26	124·7	+36·2	
1	24·7	2	28	+49	29	+61	0	11	19·8	+15·7	
2	Dec. 10·3	3	Dec. 6	−52	Dec. 8	−27	0	10	174·4	+29·4	
3	16·1	6	10	−78	15	−10	14	60	97·2	− 7·1	
4	19·1	3	16	−35	18	− 7	2	23	58·7	+22·5	
20705	21·64	7	16	−70	22	+10	3	26	24·6	− 9·9	
6	24·27	13	18	−75	30	+75	32	164	350·0	+33·8	
7	16·1	3	19	+41	21	+67	3	23	97·2	+ 5·3	
8	31·2	3	27	−53	29	−25	2	11	258·1	− 0·3	
9	31·14	10	28	−37	Jan. 6	+80	38	197	259·6	+22·1	

GENERAL CATALOGUE OF SUNSPOTS

SUNSPOTS SEEN ON ONE DAY ONLY

The groups of sunspots tabulated below were seen on one day only and appear in the *Daily Results* with a distinctive numeration, comprising the number of the rotation during which each was observed prefixed by a number, in smaller type, given in order of appearance. These short-lived groups are usually composed of one or two very small spots. The deduced time of central meridian passage of each spot is given in the fourth column of the table.

Number of Group	Date	Longitude from Central Meridian	U.T. of Central Meridian Passage	Area Corrected for Foreshortening		Position of Group	
				Umbræ	Whole Spots	Longitude	Latitude
	1964	°	1964			°	°
1475 04	Jan. 2	−23·2	Jan. 4·0	1	4	358·9	−15·5
05	3	+31·0	Dec. 31·9	1	12	39·9	+ 1·7
1476 01	10	−24·7	Jan. 12·3	0	10	249·8	−18·1
02	13	− 8·1	14·1	0	6	226·1	−16·7
03	24	−40·5	27·5	1	19	50·3	+21·2
1477 01	Feb. 9	−23·0	Feb. 11·2	0	4	216·2	+19·7
02	17	+47·5	13·8	0	12	182·3	0·0
1479 01	Apr. 5	+52·6	Apr. 1·4	2	18	275·3	+25·8
02	7	−33·6	9·9	2	10	163·1	+30·1
03	8	+16·8	7·1	0	4	200·3	+ 6·9
04	10	−20·3	11·9	0	4	135·7	−19·7
05	20	−69·7	25·6	0	10	315·0	− 9·7
1480 01	May 1	−45·8	May 4·8	0	5	194·0	+33·6
02	15	− 8·1	15·9	0	4	46·4	+ 9·8
1481 01	June 7	−55·9	June 11·6	0	12	54·4	+33·2
1482 01	20	+72·3	14·9	0	11	10·0	+ 4·4
02	20	−42·9	23·6	0	5	254·8	+17·6
03	23	−65·0	28·3	0	8	192·0	+ 6·2
04	24	− 9·6	25·1	0	7	235·6	− 5·6
1483 01	July 19	+20·0	July 17·9	0	5	293·1	+28·4
02	Aug. 7	−42·4	Aug. 10·6	0	12	340·3	+22·8
1484 01	31	−82·0	Sept. 6·5	0	6	343·9	+23·7
1485 01	Sept. 27	+60·2	22·8	0	7	129·0	+14·7
1486 01	Oct. 27	+ 7·0	Oct. 26·9	0	9	39·7	−11·0
1487 01	30	+14·3	29·3	2	10	7·7	+21·7
02	30	− 8·3	31·0	1	10	345·1	+23·2
03	Nov. 10	−57·0	Nov. 14·7	0	13	151·0	+34·1
04	25	+33·6	22·9	0	6	43·5	+22·6
1488 01	Dec. 4	−56·7	Dec. 8·6	2	17	196·3	+36·2
02	6	−62·9	11·1	0	10	163·9	+33·5
03	7	−29·6	9·6	0	4	183·7	+27·4
04	22	+61·1	17·7	0	4	77·1	+ 7·5
1489 01	26	+66·5	21·4	0	11	27·9	−10·7
02	27	+73·9	21·7	0	23	23·8	−11·8
03	29	−13·4	30·3	1	14	270·4	+ 3·6

TOTAL AREAS OF SUNSPOTS AND FACULAE

Projected and Corrected for Foreshortening for each day

The place where the photograph was taken is indicated in the second column. A photograph taken at Herstmonceux is indicated by the letter H, and those taken at the Cape and Kodaikanal by the letters C and K respectively.

The projected area is the area as it is measured on the photograph, uncorrected for foreshortening and expressed in millionths of the Sun's apparent disk.

The area corrected for foreshortening is expressed in millionths of the Sun's visible hemisphere.

The areas of faculae are given separately for the Sun's western and eastern hemispheres.

TOTAL AREAS OF SUNSPOTS AND FACULAE FOR EACH DAY IN THE YEAR 1964

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculae West	Faculae East	Umb.	Whole Spots	Faculae West	Faculae East
JANUARY								
1 C	0	0	63	136	0	0	59	151
2 C	2	35	126	377	1	18	138	429
3 C	2	25	220	566	1	14	233	639
4 C	0	2	377	419	0	2	377	418
5 C	12	69	209	325	8	44	233	349
6 C	10	62	136	427	5	34	202	455
7 C	17	82	189	283	9	43	207	347
8 C	0	23	157	439	0	12	225	489
9 C	0	18	73	356	0	9	113	389
10 H	0	17	141	293	0	10	206	339
11 C	4	25	168	199	3	17	184	196
12 C	0	29	462	503	0	25	472	529
13 H	11	67	185	392	6	49	259	442
14 C	18	116	345	293	9	65	404	314
15 C	10	81	136	157	5	42	139	206
16 H	6	61	316	283	3	35	403	319
17 H	0	9	478	348	0	6	566	395
18 H	4	17	556	305	3	11	663	327
19 C	10	67	450	230	31	195	497	351
20 C	23	120	450	293	31	182	536	407
21 C	33	203	220	430	29	185	311	455
22 C	52	247	324	482	35	170	409	531
23 C	48	279	168	199	28	160	223	235
24 H	43	301	207	316	23	164	218	327
25 H	43	241	446	424	22	125	609	588
26 C	53	265	263	348	28	141	388	409
27 H	26	203	231	275	16	123	315	356
28 H	68	293	238	43	48	209	260	57
29 H	79	422	383	174	76	413	471	230
30 H	55	301	337	348	107	558	479	412
31 C	8	61	336	231	26	197	452	262
FEBRUARY								
1 C	0	0	211	168	0	0	268	193
2 H	0	0	184	163	0	0	241	188
3 C	0	0	63	147	0	0	91	155
4 H	0	0	283	413	0	0	357	528
5 H	0	0	174	305	0	0	224	367
6 H	0	0	141	261	0	0	179	253
7 H	0	2	185	174	0	1	229	216
8 H	6	57	251	348	3	36	307	380
9 H	16	66	370	500	12	51	471	528
10 C	2	36	232	263	2	39	305	267
11 H	0	4	153	336	0	9	239	375
12 C	0	0	263	231	0	0	361	297
13 H	0	0	152	239	0	0	206	240
14 K	0	0	0	0	0	0	0	0
15 H	11	60	87	163	14	81	111	238
16 C	15	85	116	264	13	78	181	342
17 C	19	115	243	338	13	79	264	352
18 C	23	106	285	328	13	63	365	358
19 C	11	78	201	307	6	43	227	377
20 H	29	143	185	273	16	76	244	273
21 H	30	205	330	330	16	109	399	356
22 C	37	278	222	392	19	152	263	446
23 C	58	350	265	285	32	193	324	335
24 C	80	372	424	328	43	200	452	408
25 C	51	382	435	265	27	211	414	233
26 H	48	321	548	417	28	197	767	607
27 H	70	382	396	384	48	265	588	428
28 C	33	315	626	254	29	273	670	235
29 C	23	207	529	85	32	280	645	84

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculae West	Faculae East	Umb.	Whole Spots	Faculae West	Faculae East
MARCH								
1 C	8	90	402	243	32	253	537	237
2 C	0	4	413	371	0	2	507	489
3 C	2	13	372	361	1	8	358	377
4 C	0	19	350	234	0	13	377	244
5 H	0	7	451	176	0	7	497	194
6 H	0	2	286	88	0	3	330	109
7 H	0	9	572	154	0	5	678	191
8 H	0	4	363	385	0	2	373	439
9 C	0	0	213	191	0	0	251	234
10 H	0	0	341	231	0	0	409	291
11 H	8	84	385	286	6	66	479	334
12 C	42	228	290	54	36	201	307	84
13 H	22	160	475	375	19	162	583	452
14 K	32	183	234	92	24	162	295	82
15 C	60	349	428	320	55	329	505	336
16 H	29	229	474	352	59	460	612	452
17 C	23	174	472	385	53	460	720	472
18 H	24	197	396	441	21	172	514	494
19 C	34	240	366	376	24	169	478	384
20 H	44	255	533	222	26	151	711	299
21 C	49	304	333	409	26	163	358	471
22 C	114	613	194	334	62	336	196	427
23 C	90	576	527	280	55	352	608	350
24 H	75	503	500	389	58	393	624	469
25 H	58	333	435	312	53	326	493	354
26 H	32	184	460	257	35	212	619	278
27 C	17	95	367	355	22	119	391	380
28 C	14	85	366	194	18	105	442	228
29 C	2	26	228	172	1	14	270	180
30 C	0	0	129	237	0	0	157	286
31 C	0	0	444	356	0	0	485	446
APRIL								
1 C	0	9	400	302	0	16	487	392
2 K	0	12	62	278	0	15	80	305
3 C	0	0	304	326	0	0	293	327
4 C	0	0	379	250	0	0	491	261
5 H	2	18	201	392	2	18	238	496
6 H	2	27	360	416	3	41	453	553
7 H	6	38	360	483	6	36	353	549
8 H	9	39	304	484	7	28	332	452
9 H	7	22	394	450	4	14	465	530
10 H	2	20	472	371	1	11	521	419
11 H	2	9	518	395	1	5	591	488
12 C	0	11	381	576	0	26	457	737
13 H	2	18	327	429	2	21	425	457
14 H	0	9	283	588	0	8	412	678
15 H	0	0	237	395	0	0	229	400
16 H	0	0	394	483	0	0	528	686
17 H	0	0	259	338	0	0	346	378
18 H	0	0	102	282	0	0	131	355
19 C	0	0	253	275	0	0	253	286
20 H	4	45	281	258	2	33	367	322
21 C	13	112	220	176	7	61	270	179
22 H	25	108	372	259	13	55	471	356
23 H	7	72	373	384	4	36	515	463
24 C	2	70	154	253	1	48	221	257
25 C	4	71	176	176	2	46	194	166
26 C	2	13	319	176	1	10	353	240
27 C	0	7	319	264	0	7	361	333
28 H	0	0	463	339	0	0	649	428
29 H	0	0	372	452	0	0	440	500
30 H	0	0	374	125	0	0	480	150

TOTAL AREAS OF SUNSPOTS AND FACULAE FOR EACH DAY IN THE YEAR 1964

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculae West	Faculae East	Umb.	Whole Spots	Faculae West	Faculae East
MAY								
1 H	0	5	239	284	0	5	322	349
2 C	0	0	154	418	0	0	158	478
3 H	0	0	261	261	0	0	318	317
4 C	0	44	132	198	0	24	186	202
5 H	18	75	68	170	10	38	94	254
6 C	9	51	176	385	5	26	213	437
7 H	13	47	456	524	7	26	600	593
8 H	5	52	331	546	3	34	393	626
9 H	2	16	388	217	2	14	497	277
10 H	0	7	206	321	0	10	265	381
11 C	0	7	341	275	0	25	468	302
12 H	0	0	240	445	0	0	274	536
13 C	0	0	154	319	0	0	179	350
14 H	0	12	470	287	0	7	502	362
15 H	2	49	195	287	1	26	209	313
16 H	4	57	218	252	2	35	313	298
17 H	10	86	138	138	6	51	175	161
18 C	18	86	167	244	10	46	187	224
19 H	2	30	356	241	1	15	416	289
20 H	2	18	229	298	1	9	268	306
21 H	0	7	241	240	0	4	301	284
22 H	9	68	401	80	5	39	501	94
23 H	18	131	333	80	10	75	320	131
24 C	16	62	390	78	9	36	406	86
25 C	6	49	245	100	4	35	364	131
26 H	0	11	311	243	0	37	353	326
27 H	9	39	254	242	16	68	360	289
28 H	18	78	254	219	18	76	381	242
29 H	18	99	104	322	13	70	99	324
30 H	28	117	173	243	17	70	221	374
31 H	28	108	138	92	15	57	215	81
JUNE								
1 C	18	82	167	0	9	41	155	0
2 C	9	40	235	78	5	20	258	99
3 H	9	35	150	416	5	19	203	444
4 H	2	23	254	311	1	15	339	340
5 H	0	0	565	277	0	0	659	334
6 C	0	0	414	347	0	0	482	400
7 C	0	11	326	437	0	12	455	407
8 H	0	0	219	323	0	0	263	412
9 H	0	7	335	403	0	12	446	497
10 H	0	2	184	461	0	2	242	563
11 H	0	39	173	622	0	28	225	739
12 H	2	28	346	0	1	17	442	0
13 C	9	49	157	145	5	27	199	172
14 H	21	122	104	116	11	75	148	115
15 H	14	138	208	92	10	95	248	74
16 H	23	143	92	81	15	96	130	71
17 C	4	56	134	67	2	34	141	91
18 C	14	92	291	179	8	52	287	205
19 C	13	108	359	67	7	60	401	76
20 H	18	113	380	208	10	71	462	234
21 C	0	25	101	90	0	15	139	103
22 H	0	7	93	46	0	4	99	53
23 H	0	7	231	173	0	8	243	185
24 H	0	14	196	150	0	7	248	163
25 H	0	0	173	150	0	0	201	158
26 H	0	0	289	415	0	0	339	443
27 H	0	0	116	104	0	0	135	89
28 H	0	0	358	92	0	0	409	107
29 H	0	14	162	278	0	22	205	321
30 H	7	25	185	289	6	23	235	293
JULY								
1 C	0	9	112	123	0	6	162	109
2 H	0	0	151	173	0	0	206	219
3 H	0	5	138	267	0	10	173	370
4 H	2	21	173	266	2	23	226	321
5 C	4	26	67	269	4	21	94	306
6 H	0	12	127	208	0	8	175	240
7 H	0	0	104	243	0	0	169	266
8 H	0	0	104	184	0	0	128	198
9 H	0	0	220	265	0	0	273	290
10 H	0	0	220	92	0	0	258	108
11 C	0	0	45	336	0	0	63	388
12 C	0	0	45	246	0	0	41	289
13 H	0	0	242	300	0	0	263	309
14 H	7	42	138	173	5	31	169	177
15 H	28	123	196	358	17	74	304	472
16 H	5	51	358	416	3	29	411	453
17 H	7	46	81	81	4	25	112	87
18 C	2	9	268	123	1	5	354	130
19 H	0	9	161	472	0	5	192	558
20 H	0	0	185	289	0	0	183	292
21 C	0	0	112	123	0	0	125	111
22 H	0	0	196	104	0	0	231	126
23 H	0	0	277	0	0	0	347	0
24 H	0	0	81	150	0	0	95	150
25 H	0	0	81	185	0	0	100	258
26 H	0	0	92	185	0	0	108	206
27 H	0	0	81	219	0	0	95	246
28 H	0	0	138	150	0	0	147	173
29 H	0	0	150	0	0	0	190	0
30 H	0	0	69	81	0	0	76	98
31 H	0	0	127	196	0	0	147	264
AUGUST								
1 C	4	29	112	78	3	22	93	87
2 C	8	47	234	167	6	42	271	201
3 C	2	33	90	190	1	36	164	227
4 H	2	12	347	92	2	11	410	86
5 H	0	7	196	150	0	13	293	161
6 H	0	2	139	161	0	14	191	147
7 H	0	17	138	173	0	12	148	192
8 H	0	0	92	196	0	0	112	290
9 C	0	0	56	268	0	0	52	299
10 H	0	0	69	277	0	0	81	321
11 H	2	21	208	185	2	27	236	245
12 H	21	93	150	58	12	58	187	46
13 C	13	145	56	123	9	93	52	135
14 C	105	462	279	223	81	357	312	327
15 C	54	437	312	134	52	412	350	173
16 H	72	333	115	404	65	391	221	559
17 H	7	64	80	275	4	33	113	365
18 H	2	21	150	265	1	12	260	340
19 K	4	21	0	42	3	14	0	66
20 H	5	23	127	173	4	20	135	182
21 H	2	14	115	103	3	23	160	111
22 H	0	0	57	183	0	0	94	181
23 H	0	0	69	69	0	0	101	72
24 C	0	0	0	133	0	0	0	206
25 H	0	0	149	80	0	0	174	86
26 H	0	0	46	69	0	0	50	68
27 H	0	0	0	229	0	0	0	253
28 H	0	0	0	68	0	0	0	74
29 C	0	0	99	0	0	0	102	0
30 H	0	0	80	204	0	0	65	215
31 H	0	2	206	171	0	6	206	215

TOTAL AREAS OF SUNSPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1964

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Whole Spots	Faculæ West	Faculæ East
SEPTEMBER								
1 H	0	11	46	103	0	16	76	149
2 H	7	35	0	263	7	33	0	304
3 H	2	18	69	183	1	13	58	180
4 H	0	0	0	126	0	0	0	132
5 C	0	0	0	165	0	0	0	176
6 H	0	0	0	148	0	0	0	223
7 C	0	7	0	220	0	4	0	237
8 H	2	37	0	68	1	24	0	66
9 H	5	50	0	79	4	37	0	101
10 H	7	43	182	80	6	37	163	67
11 H	4	69	193	0	5	81	227	0
12 H	6	75	159	0	8	117	241	0
13 H	16	100	170	0	12	76	317	0
14 H	4	37	159	0	4	34	137	0
15 C	0	11	154	88	0	19	249	103
16 H	0	0	79	215	0	0	74	233
17 H	0	0	136	147	0	0	166	162
18 H	0	0	79	147	0	0	77	199
19 H	0	0	147	79	0	0	174	92
20 H	0	0	0	102	0	0	0	142
21 H	0	0	0	79	0	0	0	65
22 H	0	0	68	0	0	0	91	0
23 H	0	0	135	0	0	0	153	0
24 H	0	0	0	169	0	0	0	166
25 H	0	0	68	136	0	0	61	113
26 H	0	0	68	79	0	0	61	66
27 H	0	7	271	113	0	7	308	117
28 H	0	0	0	293	0	0	0	413
29 H	0	0	0	236	0	0	0	309
30 H	0	0	0	338	0	0	0	387
OCTOBER								
1 H	10	61	68	292	6	46	74	351
2 C	6	42	54	271	3	36	93	314
3 H	0	4	67	180	0	4	55	166
4 H	0	2	67	79	0	3	78	69
5 H	0	0	101	56	0	0	178	55
6 H	15	68	45	145	10	45	45	183
7 H	19	117	179	0	15	90	169	0
8 H	24	149	246	90	26	163	247	115
9 C	6	71	259	0	11	127	306	0
10 H	0	4	280	0	0	19	402	0
11 H	0	0	257	156	0	0	333	228
12 H	0	0	89	290	0	0	118	409
13 H	0	4	0	190	0	6	0	286
14 C	0	2	0	292	0	2	0	368
15 H	0	0	56	212	0	0	50	247
16 H	0	0	0	67	0	0	0	90
17 H	0	0	33	134	0	0	38	200
18 H	13	53	45	190	7	29	63	267
19 C	10	74	0	269	5	42	0	278
20 H	9	40	0	168	5	24	0	287
21 C	0	0	0	256	0	0	0	347
22 H	0	9	167	234	0	8	141	258
23 H	0	0	223	156	0	0	225	173
24 C	0	0	139	75	0	0	224	105
25 H	2	22	89	344	3	33	85	532
26 C	0	10	75	257	0	11	90	292
27 H	0	40	187	255	0	26	202	275
28 C	0	0	117	128	0	0	135	185
29 C	0	0	64	235	0	0	50	308
30 H	6	36	155	222	3	20	141	291
31 C	6	51	96	160	3	28	109	158

Date and Place	Projected Area				Corrected Area			
	Umb.	Whole Spots	Faculæ West	Faculæ East	Umb.	Spots	Faculæ West	Faculæ East
NOVEMBER								
1 H	20	77	66	165	10	39	121	172
2 H	7	29	0	165	4	15	0	160
3 H	7	26	187	88	4	14	167	124
4 C	0	0	160	74	0	0	170	120
5 H	0	0	121	132	0	0	206	169
6 H	0	7	154	143	0	6	198	147
7 H	0	0	55	275	0	0	94	265
8 C	0	13	243	32	0	8	244	48
9 H	0	0	77	198	0	0	95	286
10 H	0	13	0	242	0	13	0	288
11 H	0	0	66	88	0	0	78	97
12 C	8	36	74	64	4	20	88	90
13 K	4	19	41	114	2	11	53	144
14 C	4	32	95	85	2	20	88	86
15 H	2	22	264	165	2	16	319	202
16 C	10	85	63	180	5	50	60	287
17 C	44	182	74	138	24	102	100	153
18 C	33	171	95	264	23	125	165	251
19 C	25	131	137	42	19	117	174	55
20 H	11	127	363	198	13	135	395	305
21 C	4	42	242	127	6	72	337	219
22 C	0	12	231	180	0	24	333	217
23 C	0	0	74	244	0	0	73	246
24 C	0	0	0	168	0	0	0	161
25 H	0	9	99	154	0	6	87	149
26 C	0	0	169	84	0	0	178	84
27 H	0	0	66	165	0	0	78	172
28 H	0	11	66	77	0	9	56	87
29 C	0	11	116	74	0	12	143	79
30 H	0	0	165	143	0	0	185	174
DECEMBER								
1 H	0	0	176	55	0	0	192	50
2 H	0	0	187	66	0	0	250	132
3 H	0	0	142	196	0	0	182	276
4 C	2	15	74	305	2	17	145	404
5 C	0	0	0	232	0	0	0	268
6 C	0	25	42	264	0	26	47	262
7 C	0	10	63	295	0	7	68	294
8 C	0	19	0	252	0	12	0	239
9 C	0	0	0	147	0	0	0	139
10 C	10	42	0	230	24	102	0	311
11 H	18	73	77	132	20	80	63	154
12 C	21	95	158	221	17	75	139	208
13 C	17	69	220	178	11	43	235	222
14 C	17	53	94	168	9	29	86	173
15 C	4	59	167	115	2	30	205	99
16 C	4	73	136	125	2	62	196	174
17 C	12	63	63	105	10	51	94	129
18 H	32	203	33	120	60	366	45	292
19 C	43	215	63	241	51	253	51	347
20 C	48	276	178	251	47	252	158	263
21 C	76	327	209	283	56	241	266	246
22 C	46	296	209	199	31	200	264	230
23 C	54	243	136	188	34	153	136	176
24 C	48	267	105	63	29	165	122	61
25 C	48	237	115	94	30	151	134	140
26 H	35	172	120	185	25	126	158	230
27 C	35	197	209	115	29	172	218	113
28 H	39	277	264	242	32	227	273	295
29 C	44	268	63	42	43	221	87	51
30 C	6	94	115	83	12	135	181	100
31 C	65	200	52	105	36	111	45	128

MEAN AREAS OF SUNSPOTS AND FACULAE FOR EACH ROTATION OF THE SUN FROM 1964 JANUARY 4 TO 1964 DECEMBER 23

The mean areas have been formed by taking the means of the areas for each day of observation throughout each rotation of the Sun, the projected areas being the areas as measured on the photographs and expressed in millionths of the Sun's apparent disk, and the areas corrected for foreshortening being expressed in millionths of the Sun's visible hemisphere.

The rotations adopted in the following table (which is in continuation of those for the years 1873–1963; see p. 98) correspond to the synodic rotation of the Sun, and the commencement of each is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node of the Sun's equator on the ecliptic at mean noon on January 1, 1854, and the assumed period of the Sun's sidereal rotation being 25·38 days. The numeration of the rotations is in continuation of Carrington's series (*Observations of Solar Spots made at Redhill* by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The dates of commencement of the rotations are given in U.T.

No. of Rotation	Rotation Commenced	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
			Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1476	1964 January 3·95	27	23	134	601	19	112	713
1477	January 31·29	28	18	111	521	12	74	626
1478	February 27·63	27	29	189	680	25	176	804
1479	March 25·95	27	4	29	667	4	29	783
1480	April 22·22	28	4	34	566	2	21	682
1481	May 19·46	27	9	50	488	6	35	586
1482	June 15·66	27	3	25	360	2	17	420
1483	July 12·86	27	2	16	340	2	12	401
1484	August 9·07	27	11	63	257	9	56	311
1485	September 5·32	28	2	19	205	2	19	242
1486	October 2·59	27	4	25	268	3	23	332
1487	October 29·88	27	7	41	272	5	31	325
1488	November 26·19	28	15	78	283	14	72	327

MEAN AREAS OF SUNSPOTS AND FACULAE FOR THE YEAR

The mean projected areas are expressed in millionths of the Sun's apparent disk.

The mean areas corrected for foreshortening are expressed in millionths of the Sun's visible hemisphere.

Year	Days Photographed	Mean Projected Daily Area			Mean Corrected Daily Area		
		Umbrae	Whole Spots	Faculae	Umbrae	Whole Spots	Faculae
1964	366	11	68	420	8	56	499

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR EACH ROTATION OF THE SUN, FROM 1964 JANUARY 4 TO 1964 DECEMBER 23

The numbers given in the accompanying table have been formed as follows:

The heliographic latitude of each spot for each day has been multiplied by its area (corrected for foreshortening), and the sum of the products, for spots north of the equator, has been divided by the sum of the corresponding areas to form the mean heliographic latitude of spotted area north of the equator; similarly for spots south of the equator. In forming the mean heliographic latitude of entire spotted area, the algebraic sum of the products for spots north and south of the equator has been divided by the sum of the areas; and for the mean distance from the equator of all spots the numerical sum of the products, without regard to the sign of latitude, has been similarly divided.

The mean areas have been formed by dividing the sum of the daily areas (corrected for foreshortening) by the number of days of observation for each rotation of the Sun and are expressed in millionths of the Sun's visible hemisphere.

No. of Rotation	Rotation Commenced	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
				°		°	°	°
1476	1964 January 3·95	27	66	9·22	46	3·42	+ 4·01	6·83
1477	January 31·29	28	49	8·33	25	4·71	+ 3·90	7·10
1478	February 27·63	27	169	11·12	7	5·68	+10·41	10·89
1479	March 25·95	27	23	11·86	6	8·98	+ 7·81	11·30
1480	April 22·22	28	7	9·36	14	5·56	− 0·83	6·77
1481	May 19·46	27	35	10·09	0	—	+10·09	10·09
1482	June 15·66	27	15	25·83	2	4·41	+22·02	23·13
1483	July 12·86	27	12	21·36	0	—	+21·36	21·36
1484	August 9·07	27	56	19·46	0	—	+19·46	19·46
1485	September 5·32	28	17	28·24	2	7·68	+25·12	26·46
1486	October 2·59	27	22	24·98	1	10·59	+22·84	24·12
1487	October 29·88	27	26	22·62	5	7·80	+17·45	20·10
1488	November 26·19	28	53	32·27	19	8·00	+21·64	25·86

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR THE YEAR

Year	Days Photographed	Northern Spots Mean Daily Area	Northern Spots Mean Hel. Lat.	Southern Spots Mean Daily Area	Southern Spots Mean Hel. Lat.	All Spots Mean Hel. Lat.	All Spots Mean Dist. from Equator
			°		°	°	°
1964	366	46	17·70	10	5·32	+ 13·72	15·56

SUMMARY OF SOLAR ACTIVITY FOR THE YEAR 1964

Chief features of the record for 1964 are as follows:

(1) The minimum phase of the cycle occurred about July when the mean daily area fell to eight millionths. The mean daily area for the year was 56 millionths. Approximately one quarter of all spot groups were located in latitudes greater than 20° and were most probably of the new sunspot cycle.

(2) The spot group of largest mean area crossed the central meridian on January 24·8 in latitude 3° South; its mean area was 348 millionths.

(3) There were 108 spot-free days.

(4) The ratio of mean corrected areas of faculae/sunspots was 8·91 and that of mean corrected areas of umbrae/whole spots 0·143.

(5) The number and distribution, northern and southern hermispheres, of spot groups of

(*a*) two days' duration or longer

(*b*) one day's duration

were as follows:

	(*a*)	(*b*)
Northern spots	51	25
Southern spots	22	10
Total	73	35

(6) The following table gives the mean daily areas of sunspots (projected and corrected values) and faculae (corrected only) for each calendar month.

Month	Spots		Faculae
	Projected	Corrected	Corrected
January	121	105	697
February	127	87	659
March	160	150	782
April	24	18	785
May	46	31	612
June	39	25	521
July	11	8	414
August	58	51	341
September	17	17	228
October	28	25	338
November	35	27	311
December	125	106	331

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