

RESULTS OF MEASURES

MADE AT THE

ROYAL OBSERVATORY, GREENWICH

UNDER THE DIRECTION OF

SIR FRANK DYSON, M.A., LL.D., F.R.S.,

ASTRONOMER ROYAL,

OF

PHOTOGRAPHS OF THE SUN

TAKEN

AT GREENWICH, AT THE CAPE, AND IN INDIA

IN THE YEAR

1917.

PUBLISHED BY ORDER OF THE BOARD OF ADMIRALTY, IN OBEDIENCE TO
HIS MAJESTY'S COMMAND.



LONDON :

PRINTED AND PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE.

1922.

GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

INTRODUCTION.

§ 1. *Positions and Areas of Sun Spots and Faculæ for each Day in the Year 1917.*

The photographs from which these measures were made were taken at the Royal Observatories of Greenwich or of the Cape ; at the Kodaikánal Observatory, Southern India, or at Dehra Dún, North-West Provinces, India.

The photographs of the Sun obtained at Greenwich were taken with the Dallmeyer Photoheliograph, of 4 inches aperture, usually stopped down to 2·9 inches, giving a solar image of about 10-centimetre radius.

The photographs from the Cape Observatory were taken under the superintendence of Mr. S. S. Hough, His Majesty's Astronomer at the Cape, and those from Kodaikánal under the superintendence of Mr. John Evershed, Director of that Observatory. The photographs from Dehra Dún, which have been forwarded by the Solar Physics Committee to fill the gaps in the combined series, were taken under the superintendence of the Deputy Surveyor-General, Trigonometrical Survey of India. At three of the observatories the instrument employed was a Dallmeyer Photoheliograph giving an image of the Sun about 10 centimetres in radius ; at Kodaikánal a Cooke photo-visual object-glass of 6 inches aperture was used, the image of the Sun being on about the same 10-centimetre scale.

Photographs of the Sun were available for measurement upon each day in 1917, those finally selected for measurement being supplied by the different observatories as under :—

Greenwich	..	..	..	..	..	..	..	..	..	112
Cape	..	..	..	..	..	..	..	..	..	243
Kodaikánal	..	..	..	..	..	..	..	..	..	3
Dehra Dún	..	..	..	..	..	..	..	..	..	7
• Total	..	..	..	..	..	..	..	..	..	365

D iv INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

The names of those persons who measured the photographs for the year 1917 are as follows :—

E. W. Maunder

Annie S. D. Maunder

F. Jeffries

H. W. Newton

E. Martin

F. Whitaker

At the principal focus of the Photoheliographs excepting that at Kodaikánal two spider-lines are fixed by which the zero of position-angles on the photographs can be determined. These lines are respectively perpendicular and parallel to the equator in the Photoheliographs at the Cape and at Dehra Dún, but are inclined to it at an angle of about 45° in that at Greenwich. In the Kodaikánal Photoheliograph there is one wire fixed parallel to the equator.

The zero of position-angles for the Greenwich, Cape, and Kodaikánal Photoheliographs has been determined by the measurement of plates which have been 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 therefore produced upon the plates, and the exposures having been so given that the line joining the cusps passed approximately through the centre of the plates, the inclination of the wires of the photoheliograph to this line was measured with the position-micrometer, and a small correction for the inclination of the Sun's path was then applied. The following tables give the correction for zero of position for the mean of the two wires as thus determined for the Greenwich and Cape Photoheliographs.

The zero-corrections used during the year 1917 in the reduction of the photographs taken at Greenwich were as follows :—

Jan. 1 to Feb. 28, + $2^\circ.8$; Mar. 1 to Sept. 30, + $2^\circ.7$; Oct. 1 to Dec. 31, + $2^\circ.8$.

The zero-corrections used in the reduction of the photographs taken at the Cape Observatory were as follows :—

Jan. 1 — Jan. 13, + $0^\circ.1$

Jan. 14 — Feb. 22, + $0^\circ.0$

Feb. 23 — Mar. 5, + $0^\circ.1$

Mar. 6 — July 31, + $0^\circ.25$

Aug. 1 — Aug. 31, + $0^\circ.3$

Sept. 1 — Oct. 31, + $0^\circ.25$

Nov. 1 — Dec. 31, + $0^\circ.2$

INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917. D v

DALLMEYER PHOTOHELIOGRAPH, GREENWICH.

Date. Greenwich Civil Time.		Correction for Zero.	Date. Greenwich Civil Time.		Correction for Zero.						
d	h	°	'	d	h	°	'				
1916	December	30.	11	+ 3	03	1917	April	24.	10	+ 2	36
	"	30.	11	+ 2	47		May	26.	10	+ 2	42
1917	February	8.	12	+ 2	49		July	11.	10	+ 2	42
	March	1.	13	+ 2	38		"	11.	11	+ 2	41
	"	1.	13	+ 2	46		September	3.	9	+ 2	41
	April	2.	15	+ 2	41		"	3.	9	+ 2	43
	"	2.	15	+ 2	41		October	20.	10	+ 2	51
	"	13.	9	+ 2	55		"	20.	10	+ 2	51
	"	13.	9	+ 2	47	1918	January	11.	0	+ 2	49
	"	24.	10	+ 2	54		"	11.	0	+ 2	51

The wire frame was removed for cleaning on February 9.

DALLMEYER PHOTOHELIOGRAPH, CAPE OF GOOD HOPE.

Date. Greenwich Civil Time.		Correction for Zero.	Date. Greenwich Civil Time.		Correction for Zero.						
d	h	°	'	d	h	°	'				
1916	December	30.	8	+ 0	15	1917	July	7.	9	- 0	6
1917	January	16.	8	- 0	8		"	26.	12	+ 0	15
	February	1.	9	- 0	5		August	7.	9	+ 0	24
	"	15.	8	+ 0	2		"	21.	8	+ 0	22
	March	4.	10	+ 0	13		September	7.	11	+ 0	13
	"	10.	8	+ 0	15		"	20.	8	+ 0	14
	"	23.	8	+ 0	18		October	11.	9	+ 0	11
	April	10.	9	+ 0	16		"	25.	8	+ 0	19
	"	25.	8	+ 0	15		November	10.	8	+ 0	19
	May	8.	9	+ 0	23		"	27.	9	+ 0	3
	"	26.	12	+ 0	18		December	10.	10	+ 0	21
	June	9.	10	+ 0	18		"	24.	8	+ 0	7
	"	25.	12	+ 0	14	1918	January	7.	8	+ 0	5

A new camera box was fitted to the Cape Photoheliograph on March 5 and 6.

D vi INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

The zero-corrections adopted during 1917 for the Kodaikánal photographs were as follows:—

+0°·2 from Jan. 1 to May 27 and +0°·1 for the remainder of the year.

A new wire was inserted on May 27.

The adjustment of the wires in the Dehra Dún Photoheliograph was usually tested by stopping the driving clock immediately after a photograph had been taken and making a second exposure some two minutes after the first, a portion of a second image of the Sun, just intersecting the first, being thus obtained upon the plate.

The zero-correction adopted during 1917 for the Dehra Dún photographs was—0°·8.

The measures of the photographs were made with a large position-micrometer constructed by Messrs. Troughton and Simms for the measurement of 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 screw-action about a pivot in its circumference, 90° distant from that of the upper plate, this pivot being mounted on a circular plate with a position-circle which rotates 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 position-circle. When this has been done, a positive eyepiece, having at its 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 diametrically across the photograph, the diaphragm being nearly in contact with the photographic film, so that parallax is avoided. The distance of a spot or facula from the centre of the Sun is read off by means of a scale and vernier to 1-250th of an inch (corresponding to 0·001 of the Sun's radius for photographs having a solar diameter of 8 inches). The position-angle is read off on 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° between the photograph and the plate below.

All photographs are measured independently by two persons, and the means taken.

In the case of large or complex groups of spots, the positions of the chief components are measured individually, and also for groups so near the east or west limbs of the Sun that the effects of foreshortening are appreciable. In other cases the position of the centre of a group is estimated in the micrometer. In this respect a difference has been made in the practice during years previous to 1916, where in this section components of groups are given separately and combined into groups in the Ledgers.

When required, corrections are applied to the measured distances and position-angles for differential refraction. The formula is given in the *Introduction* for 1909. It is seldom necessary, however, to apply this correction except to a few photographs taken at Greenwich in mid-winter.

The calculations of heliographic longitude and latitude are made by use of the formulæ given in "Researches on Solar Physics: Heliographical Positions and Areas of Sun Spots observed with the Kew Photoheliograph during the years 1862 and 1863" by W. De La Rue, B. Stewart, and B. Loewy. *Phil. Trans.*, 1869. If r be the measured distance of a spot from the centre of the Sun's apparent disc, R the measured radius of the Sun on the photograph, (R) the tabular semi-diameter of the Sun in arc, and ρ , ρ' the angular distances of a spot from the centre of the apparent disc as viewed from the Sun's centre and from the Earth respectively, ρ is obtained from the equations:—

$$\rho' = \frac{r}{R}(R); \text{ and } \sin(\rho + \rho') = \frac{r}{R}.$$

If D and λ are the heliographic latitudes of the Earth and the spot respectively, referred to the Sun's equator, and l the heliographic longitude of the spot from the solar meridian passing through the centre of the disc, longitudes west of the centre being reckoned as positive, and x the position-angle from the Sun's axis,

$$\sin \lambda = \cos \rho \sin D + \sin \rho \cos D \cos x$$

$$\sin l = -\sin x \sin \rho \sec \lambda.$$

The position-angle x is found from the position-angle from the North Point by subtracting P , the position-angle of the N end of the Sun's axis, measured eastward from the North Point of the disc. The heliographic longitude of the spot is $l+L$, where L is the heliographic longitude of the centre of the disc. The three quantities P , D , and L for the time of the exposure of each photograph are derived from the Ephemeris for Physical Observations of the Sun given on p. 522 of the *Nautical Almanac* for 1917.

D viii INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

The inclination of the Sun's axis to the ecliptic is assumed to be $82^{\circ} 45'$, the longitude of the ascending node for 1917.0 to be $74^{\circ} 36'.2$, and the period of the Sun's sidereal rotation to be 25.38 days; the meridian which passed through the ascending node 1854 January 1, Greenwich Mean Noon, being taken as the zero meridian.

§ 2. *General Catalogue of Groups of Sun Spots for 1917.*

The Catalogue contains every group of spots which lasted for two or more days, and the group numbers are in continuation of those given in 1916 and previous years. Groups seen only once are not included, but appear in the Daily Results with a distinctive numeration.

During the year 1917, a number of groups of spots have been noted in the Catalogue as "Revivals." These have been tabulated in series in the following table. The respective groups of each series are in the same heliographic position, and are seen in consecutive rotations but with definite breaks in their history between each rotation. The latter feature excludes them from being classed as "Recurrent" groups; they differ from "Intermittent" groups in their being of long period intermittency. When a "Recurrent" series forms part of a "Revival" series, a reference is made in the last column of the table. Other groups which are given in detail in Ledger II are also indicated.

[TABLE

INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917. Dix

REVIVAL GROUPS OF SUN SPOTS, 1917.

Reference No. of Series.	Group No.	Duration.	First Seen.		Last Seen.		Mean Area.	Mean Position.			Reference to Ledger.
			Date.	Longitude from C.M.	Date.	Longitude from C.M.		Longitude System I.	Longitude System II.	Latitude.	
1	7913	d	1916-17	0	1916-17	0					
	7945	6	Dec. 16.	+4	Dec. 21	+72	71	19	18	-23	
2	7899	2	Jan. 9	-43	Jan. 10	-28	5	17	18	-25	
	7920	6	Dec. 5	+19	Dec. 10	+82	240	180	186	+7	} I.782
	7961	13	" 24	-81	Jan. 5	+78	153	188	188	+8	
	4	Jan. 25	-15	" 28	+25	23	194	188	+8		
3	7922	6/8	Dec. 25	-38	Jan. 1	+53	7	218	218	-17	II.
	7959	5/7	Jan. 21	-42	" 27	+43	9	223	222	-19	II.
	7995	7	Feb. 19	-14	Feb. 25	+67	18	226	221	-17	II.
4	7926	13	Dec. 28	-78	Jan. 9	+78	1396	136	136	+14	} I.784
	7962	10	Jan. 25	-73	Feb. 3	+58	76	142	138	+13	
	8005	3	Mar. 1	+35	Mar. 3	+66	17	143	135	+13	
5	7930	4	Dec. 31	+19	Jan. 3	+61	21	200	200	+10	II.
	7960	9	Jan. 21	-58	" 29	+50	71	205	201	+11	
6	7938	3	Jan. 8	+16	Jan. 10	+44	11	89	88	+14	II.
	7974	2	Feb. 2	-16	Feb. 3	-1	3	88	84	+14	
7	7939	6/7	Jan. 8	+1	Jan. 14	+79	130	73	73	+23	} I.786 } I.789
	7969	9	" 30	-71	Feb. 7	+33	141	69	72	+23	
	8002	12	Feb. 27	-70	Mar. 10	+79	190	66	73	+25	
	8038	8	Mar. 26	-69	Apr. 2	+23	78	67	74	+24	
8	7941	11	Jan. 8	-59	Jan. 18	+78	107	15	14	+15	II.
	7978	9	Feb. 4	-61	Feb. 12	+48	97	17	11	+12	II.
9	7952	6/7	Jan. 16	-67	Jan. 22	+14	11	262	263	-23	II.
	7986	11	Feb. 11	-84	Feb. 21	+40	110	255	259	-23	II.
10	7955	12	Jan. 18	-70	Jan. 29	+78	103	233	229	-11	II.
	7993	10	Feb. 16	-47	Feb. 25	+79	83	233	225	-12	II.
	8021	8	Mar. 13	-76	Mar. 20	+20	12	233	225	-15	II.
11	7968	4	Jan. 28	-67	Jan. 31	-33	9	99	100	+22	II.
	7999	10	Feb. 24	-71	Mar. 5	+44	100	101	102	+21	
12	7973	2	Feb. 2	+23	Feb. 3	+37	3	127	119	+7	II.
	8007	4	Mar. 2	+37	Mar. 5	+73	73	130	118	+10	
13	7976	6	Feb. 3	+3	Feb. 8	+70	151	92	97	+25	} I.790
	8009	6	Mar. 3	+12	Mar. 8	+78	359	92	97	+24	
	8037	5	" 24	-74	" 28	-24	27	90	96	+23	
14	8001	3	Feb. 26	+49	Feb. 28	+75	4	197	209	-27	II.
	8026	9	Mar. 16	-71	Mar. 24	+30	48	194	214	-29	
15	8014	3	Mar. 8	+15	Mar. 10	+36	8	27	13	-9	II.
	8044	2	Apr. 5	+25	Apr. 6	+43	3	32	15	-10	

D X INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

REVIVAL GROUPS OF SUN SPOTS, 1917.

Reference No. of Series.	Group No.	Duration.	First Seen.		Last Seen.		Mean Area.	Mean Position.			Reference to Ledger.
			Date.	Longitude from C.M.	Date.	Longitude from C.M.		Longitude System I.	Longitude System II.	Latitude.	
16	8020	d 3	Mar. 12	+46	Mar. 14	+78	23	13	2	+13	} I.800
	8045	3/5	Apr. 6	+21	Apr. 10	+71	17	11	359	+15	
	8071	6	May 3	+11	May 8	+76	60	8	359	+17	
	8093	13	" 23	-76	June 4	+79	138	13	359	+16	
17	8025	4	Mar. 16	+48	Mar. 19	+82	186	314	298	+8	} II. II.
	8042	6/7	Apr. 2	-80	Apr. 8	-2	18	323	301	+5	
18	8034	12	Mar. 23	-78	Apr. 3	+73	85	102	90	+13	} I.792 II.
	8058	12	Apr. 19	-72	" 30	+76	202	108	89	+12	
	8087	11	May 17	-54	" 27	+78	204	117	89	+10	
19	8041	5/6	Apr. 2	-27	Apr. 7	+42	4	18	19	-21	} I.798 I.816
	8062	12	" 26	-69	May 7	+77	371	21	22	-21	
	8065	9	" 29	-23	" 7	+76	94	24	32	-23	
	8089	13	May 22	-81	June 3	+76	484	22	37	-24	
	8125	13	June 19	-77	July 1	+80	229	16	35	-25	
	8163	12	July 17	-72	" 28	+70	74	10	22	-23	
	8207	13	Aug. 13	-72	Aug. 25	+83	671	13	30	-23	
	8247	4	Sept. 10	-70	Sept. 13	-31	32	6	33	-24	
19*	8050	11	Apr. 12	-59	Apr. 22	+77	49	214	206	-17	} II. II. II.
	8078	12	May 9	-65	May 20	+86	176	214	201	-16	
	8079	8/11	" 10	-51	" 20	+83	88	213	209	-19	
20	8054	13	Apr. 14	-73	Apr. 26	+79	56	172	197	-28	} I.795 II.
	8080	9	May 11	-79	May 19	+26	46	170	196	-28	
	8107	11/12	June 7	-80	June 18	+62	32	171	193	-25	
21	8056	9	Apr. 18	-38	Apr. 26	+66	59	159	158	+20	} I.797 II.
	8082	7	May 13	-66	May 19	+14	22	158	150	+18	
	8108	13	June 8	-79	June 20	+78	415	160	155	+19	
22	8060	3	Apr. 24	-34	Apr. 26	-8	8	81	55	+7	}
	8098	4	May 26	+35	May 29	+77	11	89	58	+8	
23	8075	9	May 7	-42	May 15	+69	107	265	244	-12	} II. II.
	8105	8	June 4	-20	June 11	+81	143	276	243	-9	
24	8085	10	May 15	-58	May 24	+65	145	142	110	+6	} II. I.802
	8112	12	June 9	-77	June 20	+78	99	153	116	+7	
	8148	11	July 7	-66	July 17	+75	127	155	112	+8	
25	8099	12	May 26	-72	June 6	+80	133	343	307	-6	} II. II.
	8131	4/7	June 24	-37	" 30	+45	6	353	315	-9	
26	8120	11	June 15	-58	June 25	+78	370	91	65	+13	} I.803 I.807
	8153	6	July 10	-84	July 15	-15	36	94	57	+10	
	8166	2	" 21	+66	" 22	+81	49	98	61	+11	
	8193	11	Aug. 6	-77	Aug. 16	+59	94	102	54	+8	

D xii INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

REVIVAL GROUPS OF SUN SPOTS, 1917.

Reference No. of Series.	Group No.	Duration.	First Seen.		Last Seen.		Mean Area.	Mean Position.			Reference to Ledger.
			Date.	Longitude from C.M.	Date.	Longitude from C.M.		Longitude System I.	Longitude System II.	Latitude.	
41	8274	d	1917-18	°	1917-18	°					
	8304	3	Oct. 1	-18	Oct. 3	+8	3	141	161	-23	
42	8278	9	Oct. 5	-31	Oct. 13	+84	163	79	79	+20	II.
	8306	8	" 30	-58	Nov. 6	+33	41	77	106	+24	II.
43	8279	4/5	Oct. 6	+6	Oct. 10	+56	16	97	96	-20	
	8301	4	" 27	-75	" 30	-40	40	99	79	-18	
44	8283	8/11	Oct. 11	-75	Oct. 21	+60	42	314	266	+12	II.
	8293	2	" 17	+10	" 18	+25	9	320	294	+16	
	8312	10	Nov. 6	-83	Nov. 15	+35	84	320	280	+14	II.
45	8303	6	Oct. 29	+7	Nov. 3	+76	156	159	86	+5	II.
	8329	2/3	Nov. 24	-6	" 26	+21	7	160	77	+3	
46	8311	2	Nov. 5	+54	Nov. 6	+66	6	111	73	-15	
	8328	13	" 23	-73	Dec. 5	+80	684	107	72	-16	
	8370	13	Dec. 19	-83	" 31	+76	330	116	59	-12	I.827
47	8313	6	Nov. 7	+7	Nov. 12	+79	99	41	336	+9	II.
	8340	12	" 28	-71	Dec. 9	+79	145	45	327	+7	
	8378	13	Dec. 24	-82	Jan. 5	+77	204	51	329	+7	I.830
48	8319	10	Nov. 13	-65	Nov. 22	+53	83	248	209	+15	II.
	8361	5	Dec. 15	+9	Dec. 19	+58	18	257	212	+14	
49	8320	11	Nov. 15	-83	Nov. 25	+45	102	202	132	+8	II.
	8355	13	Dec. 12	-81	Dec. 24	+78	238	211	136	+9	II.
50	8324	10	Nov. 19	-56	Nov. 28	+62	49	178	135	-14	II.
	8365	9	Dec. 18	-27	Dec. 26	+81	44	186	141	-14	II.
51	8333	10	Nov. 26	-46	Dec. 5	+71	66	93	80	-19	II.
	8372	12	Dec. 20	-83	" 31	+59	90	100	63	-16	II.
	8412	8	Jan. 22	-6	Jan. 29	+81	581	102	68	-16	
52	8336	3	Nov. 28	+37	Nov. 30	+67	12	154	184	+24	
	8368	10	Dec. 19	-39	Dec. 28	+79	122	159	192	+24	II.
53	8352	13	Dec. 10	-83	Dec. 22	+80	408	236	185	-13	II.
	8395	3/4	Jan. 11	-15	Jan. 14	+24	4	239	182	-13	
54	8371	10	Dec. 20	-53	Dec. 29	+69	103	133	158	-23	II.
	8408	3/4	Jan. 20	0	Jan. 23	+37	7	135	151	-22	
55	8373	3	Dec. 21	+35	Dec. 23	+65	43	209	120	+4	
	8397	6	Jan. 13	-17	Jan. 18	+51	37	212	117	+4	

§ 3. *Ledgers of the Areas and Heliographic Positions of Groups of Sun Spots for 1917.*

Ledger I.—Recurrent Groups.—This Ledger supersedes the Catalogue of Recurrent Groups of Sun Spots given in years previous to 1916 of the *Greenwich Photo-Heliographic Results*, and the reference numbers of the series are in continuation of those given therein. The groups forming this Ledger have been abstracted from a general Ledger of all spot groups seen throughout the year, and were selected upon the following plan, reference being made to the General Catalogue :—If any spot group when first seen was 60° or more to the east of the Central Meridian, then the Catalogue, and, if necessary, the Daily Results also, were searched some fifteen or 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, then the Catalogue was searched some fifteen or sixteen days later, to ascertain whether a spot group of similar heliographic longitude and latitude was then near the east limb of the Sun. Both the search forward and the search backward have been made in the case of every spot group that was observed close to both the east and west limbs, in order that no possible case of identity might be overlooked. When there appeared to be a case of probable identity between spot groups observed in two consecutive rotations of the Sun, the character of the second group has been carefully compared with that of the first in each of the three elements—area, longitude, and latitude. In cases where the evidence appeared to render probable the continued existence of the spot, it has been numbered in the Ledger, and where there has been some uncertainty a note has been added. If, on the other hand, the evidence appeared to go in the other direction, but was not quite decisive, the series has been printed in the Ledger but a separate number has not been given it. It has been distinguished by the number of the preceding series, placed in brackets and marked with an asterisk. In cases where a well-defined series has been recorded, there have sometimes been included in brackets spot groups undoubtedly belonging to the same general disturbance, but for which the evidence of continuity was not sufficient.

Besides the Ledgers of the groups, there have been printed in a similar manner important components of the principal groups. This has been done in all cases where it appeared probable that an individual component lasted to the second or third rotation after its first appearance.

Ledger II.—Non-Recurrent Groups.—This Ledger contains the most important of those groups which do not last to a second rotation. Individual components are also given after their respective groups, where they are large and distinctive.

D xiv INTRODUCTION TO GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1917.

§ 4. *Total Areas of Sun Spots and Faculae for each day, and Mean Areas and Mean Heliographic Latitude of Sun Spots and Faculae for each Rotation of the Sun, and for the year 1917.*

Particulars relating to this section are given in the headings on pages D 162-3.

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Royal Observatory, Greenwich,

1922 February 8.

ROYAL OBSERVATORY, GREENWICH.

POSITIONS AND AREAS
OF
SUN SPOTS AND FACULÆ.

FOR EACH DAY IN THE YEAR

1917.

POSITIONS AND AREAS OF SUN SPOTS AND FACULÆ FOR EACH DAY IN THE YEAR 1917.

- Col. 1. (1) Time when photograph was taken expressed in days and decimals of a day reckoning from midnight at commencement of year. (2) Place of observatory—Greenwich (G), Cape of Good Hope (C), Kodaikanal (K), Dehra Dûn (D). (3) Date of photograph (Civil reckoning).
 Col. 2. Number of Spot Group in order of appearance and in continuation of the Group-numbers given in previous years. Groups seen on one day only are distinguished by the number of the Rotation during which they were observed and by a letter given in the order of their appearance. When there is no number in the second column, it is to be understood that there is a Facula unaccompanied by a Spot.
 Col. 3. Distance of Spot Group or Faculæ from Sun's centre in terms of the Sun's radius.
 Col. 4. Position Angle of Spot Group or Faculæ measured from the North pole of the Sun's axis in the direction N., E., S., W., N.
 Col. 5. Heliographic Longitude of the Spot Group or Faculæ derived from the measures.
 Col. 6. Heliographic Latitude of the Spot Group or Faculæ similarly derived.
 Col. 7. Area of Umbrae corrected for foreshortening in millionths of the Sun's visible hemisphere.
 Col. 8. Area of Whole Spots composing the Group similarly expressed.
 Col. 9. Area of each group of Faculæ similarly expressed. The positions of Faculæ relative to the Spots with which they are associated are indicated by the letters *n, s, p, f, c*, denoting respectively north, south, preceding, following, concentric.
 In line with the date of each day is given in brackets the position angle of the Sun's axis from the North point; the heliographic longitude and latitude of the centre of the disc; the total areas of Spots and Faculæ for the day.

G.M.T. (Civil.)	Group No.	MEASURES.		POSITION.		AREA.			G.M.T. (Civil.)	Group No.	MEASURES.		POSITION.		AREA.			
		Dist.	Pos. Angle.	Long.	Lat.	Umbrae.	Whole Spots.	Faculæ.			Dist.	Pos. Angle.	Long.	Lat.	Umbrae.	Whole Spots.	Faculæ.	
1917.			°	°	°				1917.			°	°	°				
0.364		.966	290.3	237.3	+18.6			169	1.342	7931	.574	234.0	181.8	-22.5	6	24		
		.948	257.3	236.0	-13.0			65		7924	.479	352.8	155.5	+25.0	0	2		
		.938	305.9	228.0	+31.9			330		7933	.335	187.8	154.5	-22.6	1	3		
	7922	.812	250.8	217.9	-17.4	2	14	402c		7925	.164	179.1	151.5	-12.7	2	4		
	7918	.782	243.6	213.7	-22.4	38	217	182s		7926	.405	42.8	135.3	+14.0	337	1416		
	7930	.610	291.9	199.6	+10.6	8	38		C	7929	.677	67.0	112.2	+12.7	95	581	797c	
	7920	.435	297.3	187.5	+8.6	30	139			7932	.777	103.8	101.2	-12.7	2	12	208c	
	7923	.332	240.1	181.7	-12.5	5	9				.814	42.2	110.3	+34.5			488	
	C	7931	.428	219.3	181.6	-22.2	7	20			.750	58.2	108.9	+20.8			173	
		7925	.277	127.1	151.6	-12.6	2	5			.915	74.6	87.2	+12.7			103	
		7924	.543	28.5	148.0	+25.5	1	5			.953	61.8	83.4	+25.5			582	
		7926	.505	58.3	135.0	+14.5	322	1740	503c	Jan. 2		(+1.6)	(151.7)	(-3.3)	(504)	(2422)	(3705)	
		7928	.725	119.2	121.4	-22.9	0	2	107f									
		7929	.814	71.8	112.4	+12.8	111	599	654c									
		7932	.876	102.9	103.8	-12.7	2	12	175c									
			.878	48.3	112.7	+33.8			361	2.364	.983	253.7	217.9	-16.6			420	
			.865	62.4	109.1	+21.8			385		.903	238.5	200.5	-29.8			362	
	Jan. 1		.910	113.3	100.1	-22.4			100		.886	301.5	195.0	+25.7			337	
				(+2.1)	(164.6)	(-3.1)	(528)	(2800)	(3433)		7918	.967	248.1	213.4	-22.0	21	147	269sf
										846d	.910	281.1	202.5	+8.6	2	14		
										7930	.890	283.1	199.6	+10.0	0	6		
	1.342	.918	253.8	218.1	-16.2			381		7920	.778	284.0	187.8	+8.6	38	144	307c	
		.905	277.4	215.8	+5.2			140		7931	.743	242.3	183.5	-22.6	1	7	136c	
		.908	289.8	214.5	+16.5			99		C	7923	.699	257.1	182.0	-11.4	4	10	78p
		.837	237.2	205.0	-29.0			206		7933	.413	219.7	154.6	-21.7	0	3		
		.834	306.1	200.8	+27.2			80		7925	.276	233.1	151.2	-12.8	1	4		
		.978	186.8	188.3	-78.8			19		7926	.305	7.5	135.9	+14.1	234	1237		
	C	7918	.889	246.6	213.4	-22.3	26	186	240s		7929	.507	57.3	112.4	+12.7	97	642	
		7930	.765	285.8	199.8	+9.8	4	24	189c			.866	51.7	86.5	+30.2			245
		7920	.614	288.5	187.6	+8.5	26	155				.907	62.3	77.5	+23.3			818
		7923	.525	251.8	182.2	-12.2	5	15		Jan. 3		(+1.1)	(138.2)	(-3.4)	(398)	(2214)	(3554)	

Group 7918, 1916 Dec. 22-1917 Jan. 3. Return of Group 7895. A large regular spot, slightly elongated and developing a double umbra by Dec. 30. It has divided into two spots by Jan. 3. One or two small distant followers are occasionally seen.
 Group 7920, 1916 Dec. 24-1917 Jan. 5. Return of Group 7899. A large regular spot with occasionally one or two small faint followers.
 Group 7922, 1916 Dec. 25-1917 Jan. 1. A very small spot *n* Group 7918 on Dec. 25. Two are seen on Dec. 26, and several in a long straight stream on Dec. 27, of which only the first and last spots remain by Dec. 28. The group is not seen on Dec. 30 and 31, but two very small spots are seen in the neighbourhood on Jan. 1.
 Group 7923, 1916 Dec. 26-1917 Jan. 3. Three small spots on Dec. 26, which have developed by Dec. 28 into a short compact stream, of which the central portion is the most stable. The group diminishes after Dec. 29 and only one small spot remains by Jan. 1.
 Group 7924, 1916 Dec. 27-1917 Jan. 2. A small regular spot on Dec. 27, near the place of Group 7896, but more probably a new formation. A distant train of spots has come into view by Dec. 28, of which only one remains on Dec. 31. This is also seen on Jan. 1, when the original leader has disappeared, but on Jan. 2 a very small marking is visible near the original leader's position.
 Group 7925, 1916 Dec. 27-1917 Jan. 3. Return of Group 7905. A wide pair of small spots of which the rear has disappeared by Dec. 31.
 Group 7926, 1916 Dec. 28-1917 Jan. 9. A fine stream of spots, of which the leader is a very large regular spot, which becomes elongated in a direction parallel to the equator, and finally divides into two. Probably a new outburst near Group 7903; not a return.
 Group 7928, 1916 Dec. 30-1917 Jan. 1. A small spot in bright faculæ, not seen on December 31.
 Group 7929, 1916 Dec. 30-1917 Jan. 11. A large stream of normal type *f* Group 7926. Both the leader and rear spots are large and regular and crossed by several bright bridges after Jan. 3. Group 7930, 1916 Dec. 31-1917 Jan. 3. A pair of small spots on Dec. 31, of which the leader has nearly disappeared by Jan. 1; a loose cluster of very small markings on Jan. 2 and 3.
 Group 7931, Jan. 1-3. A small stream *s* Group 7923. Group 7932, Jan. 1-2. Two or three very small spots. Group 7933, Jan. 2-3. One or two minute spots.