

GREENWICH  
PHOTO-HELIOGRAPHIC  
RESULTS.

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1915.

pg 90 line 20. col 3 from 7464e to 7564e

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## ERRATA.

### GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1915.

#### MEASURES OF POSITIONS AND AREAS OF SUN SPOTS AND FACULÆ, 1915.

PAGE	COL.	LINE	
D 2	1	9	Day and Decimal, for 0°551, read 1°551.
D 11	7	35	Latitude, for -14°7, read +14°7.

Also in the footnotes:—

PAGE	
D 18	Group 7216, for April 2, read April 3.
D 92	Group 7586, for Jan. 8, read Jan. 7.

# GREENWICH PHOTO-HELIOGRAPHIC RESULTS, 1915.

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## INTRODUCTION.

§ 1. *Measures of Positions and Areas of Sun Spots and Faculæ on Photographs taken at the Royal Observatories of Greenwich, and of the Cape, and in India, at Kodaikáanal and at Dehra Dûn, in the year 1915; with the deduced Heliographic Longitudes and Latitudes.*

The photographs from which these measures were made were taken at the Royal Observatories of Greenwich or of the Cape; at the Kodaikáanal Observatory, Southern India, or at Dehra Dûn, 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. The instrument was used in the Transit of Venus expedition to New Zealand in 1874, and, as now adapted, gives a solar image of about 10-centimetre radius on the photographic plate.

The photographs have been taken throughout the year on gelatine dry plates; "Process," or "Lantern," supplied by the Imperial Dry Plate Company, being used, with hydroquinone development.

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 Kodaikáanal under the superintendence of Mr John Evershed, Director of that Observatory. The photographs from Dehra Dûn, 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 Kodaikáanal a Cooke photo-visual object-glass of 6 inches aperture was used, the image of the Sun being on about the same 10-centimetre

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scale. The plates and development used have been much the same at each of the four collaborating observatories.

Photographs of the Sun were available for measurement upon each day in 1915, those finally selected for measurement being supplied by the different observatories as under :—

Greenwich . . . . .	201
Cape . . . . .	136
Kodaikáanal . . . . .	11
Dehra Dún . . . . .	17
Total . . . . .	<hr/> 365

The measures were made in the manner described in the *Introduction to the Greenwich Photo-Heliographic Results* for 1909, and the results of the measures are printed upon the same general plan, the following being the signatures of those persons who measured the photographs for the year 1915 :—

E. W. Maunder	-	-	M	J. S. Smith	-	-	JS
H. W. Newton	-	-	N	Annie S. D. Maunder	-	-	AM
J. Van Dingenen	-	-	VD				

At the principal focus of the photoheliographs one or two spider-lines are fixed by which the zero of position-angles on the photographs can be determined. There is only one such spider-line in the Kodaikáanal photoheliograph, and this is placed horizontally. In the other photoheliographs two spider-lines are used, crossing each other at right angles at the centre of the field. 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.

The method of determining the zero of position-angles for the Dallmeyer Photoheliograph at the Royal Observatory, Greenwich, was the same as that used for the Thompson Photoheliograph, as described in 1909, except that, as in 1913, and as just noted, the two spider-lines were arranged nearly at an angle of 45° to the equator.

The determinations obtained were the following :—

MEASURES OF PHOTOGRAPHS OF THE SUN.

D v

DALLMEYER PHOTOHELIOGRAPH, GREENWICH.

Date, Greenwich Civil Time.			Correction for Zero.	Date, Greenwich Civil Time.			Correction for Zero.
1914	December	d h m		1915	June	d h m	
		14. 11 4	+2 38'			16. 12 20	+2 28'
1915	January	14. 12 34	+2 42			17. 10 22	+2 32
		2. 12 44	+2 45			21. 7 20	+2 28
February		18. 10 57	+2 38	July		9. 12 16	+2 31
		18. 13 2	+2 49			15. 8 4	+2 30
		5. 10 15	+2 39			26. 8 14	+2 31
March		10. 12 6	+2 37	August		10. 16 9	+2 39
		23. 11 12	+2 42			19. 15 34	+2 26
		26. 9 35	+2 36			25. 9 43	+2 40
April		8. 14 28	+2 42	September		6. 8 25	+2 20
		20. 11 44	+2 40			9. 11 18	+2 37
		30. 10 30	+2 30			18. 9 39	+2 41
May		31. 9 48	+2 35	October		29. 14 44	+2 36
		15. 8 1	+2 29			12. 9 53	+2 36
		16. 9 29	+2 30			14. 12 28	+2 52
		19. 11 15	+2 41			20. 12 47	+2 44
		19. 15 45	+2 30			22. 9 57	+2 50
June		21. 12 39	+2 43	November		10. 10 14	+2 48
		6. 7 54	+2 32			11. 11 48	+2 47
May		6. 12 50	+2 36	December		26. 11 36	+2 46
		25. 9 50	+2 27			23. 10 11	+2 34
		26. 16 2	+2 33			23. 10 18	+2 41
June		7. 10 36	+2 30	1916	January	28. 11 14	+2 45
						10. 11 43	+2 47

The zero-corrections used in the reduction of the photographs taken at Greenwich with the Dallmeyer Photoheliograph were as follows :—

Date.	Correction for Zero.	Date.	Correction for Zero.
From 1915 January 1 to January 31	+2.7	From 1915 October 1 to 31	+2.7
„ „ February 1 „ May 3	+2.6	„ „ November 1 „ 30	+2.8
„ „ May 5 „ July 31	+2.5	„ „ December 1 „ 31	+2.7
„ „ August 1 „ September 30	+2.6		

Some slight adjustments were made to the declination axis of the photoheliograph on 1915 May 4.

The double-image method, as described in 1909, was employed with the Dallmeyer Photoheliograph, at the Royal Observatory, Cape of Good Hope, and the following determinations were obtained :—

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DALLMEYER PHOTOHELIOGRAPH, CAPE OF GOOD HOPE.

Date. Greenwich Civil Time.			Correction for Zero.		Date. Greenwich Civil Time.			Correction for Zero.					
	d	h	m	°	'		d	h	m	°	'		
1914	December	3.	8	10	+0	7	1915	June	29.	12	16	+0	18
		17.	9	2	+0	4		July	13.	10	40	+0	33
1915	January	4.	7	50	-0	4			27.	8	35	+0	15
		18.	8	49	+0	6		August	12.	10	44	+0	6
	February	3.	9	1	-0	1		September	10.	11	57	+0	7
		18.	9	15	+0	4			22.	10	59	+0	12
	March	5.	10	26	+0	11		October	5.	8	5	+0	4
		20.	10	39	0	0			20.	9	51	+0	2
	April	6.	8	56	+0	10		November	3.	8	23	+0	1
		20.	8	52	+0	17			19.	8	19	+0	6
	May	5.	9	0	+0	10		December	6.	8	27	+0	4
		23.	9	24	+0	10			21.	9	20	Definition bad.	
	June	4.	10	43	+0	11	1916	January	7.	12	24	+0	6
		24.	9	26	+0	15			24.	10	22	+0	3

The wire frame was removed for cleaning on 1914 December 31 and 1915 November 5.

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

Date.	Correction for Zero.	Date.	Correction for Zero.
	0		0
From January 1 to February 28	0.0	From July 1 to July 31	+0.3
„ March 1 „ March 31	+0.1	„ August 1 „ August 31	+0.2
„ April 1 „ June 30	+0.2	„ September 1 „ December 31	+0.1

The zero-corrections for the photographs taken at the two Indian Observatories were determined in the same general manner, a correction of  $+0^{\circ}.4$  for those taken at Kodaikānal, and of  $-0^{\circ}.8$  for those from Dehra Dūn, being applied throughout the year 1915.

The method of reduction of the measures of the photographs is the same as that described in the *Introduction to the Greenwich Photo-Heliographic Results* for 1909. The inclination of the Sun's axis to the ecliptic is assumed to be  $82^{\circ} 45'$ , the longitude of the ascending node for 1915.0 to be  $74^{\circ} 34'.4$ , 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. *Ledgers of Areas and Heliographic Positions of Groups of Sun Spots deduced from the measurement of the Solar photographs for each day in the year 1915.*

§ 3. *Catalogue of Recurrent Groups of Sun Spots compiled from the Ledgers of Groups of Sun Spots for the year 1915.*

§ 4. *Total Areas of Sun Spots and Faculæ for each day, and Mean Areas and Mean Heliographic Latitude of Sun Spots and Faculæ for each Rotation of the Sun, and for the year 1915.*

These three sections are similar to the corresponding sections for 1911.

F. W. DYSON.

*Royal Observatory, Greenwich,  
1920 May.*