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Spectroscopic Investigations of the Sun

PART I

GENERAL OUTLINE OF OBSERVATIONS, INSTRUMENTS, AND
METHODS—SECTION 6

BY

RALPH E. DELURY AND JOHN L. O'CONNOR

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GENERAL OUTLINE OF OBSERVATIONS, INSTRUMENTS AND METHODS

SECTION 6—DIFFERENTIAL EFFECTS IN BLENDED SPECTRA

BY

RALPH E. DELURY AND JOHN L. O'CONNOR.

Observations have been made of definite blendings of spectra to determine the effects on the measurement of spectrum lines¹. A knowledge of this is desirable, not only for solar but for all spectroscopic investigations on account of the impossibility of observing a spectrum free from blending; and indeed it is often desirable to resolve a blended spectrum into its components. This requirement has arisen in our investigations, and especially so in the measurements of a group of six spectrum lines in a great number of observations. Fortunately, these lines are on the plates of the observations cited, and they have been measured doubly by each of the writers.

Observations.—The observations, which were photographic, were made with the 80 ft. (24.4 m.) cœlostat and the 23 ft. (7 m.) solar spectrograph using reflecting prisms by means of which a strip of spectrum from one limb is photographed simultaneously with and between two strips from the diametrically opposite limb. Details of the observations are given in Table I. Plate L854 was taken September 20, 1911; plates L911 to L913 on June 22, 1912; and plates L914 to L917 on June 24, 1912. On the two latter dates the observing conditions were recorded as, "Bright day, steady, with general haze", and "Bright, but steady. Haze over all", respectively. In the first three columns of the table are given, respectively, the number of the plate, the position angles of the limb observations measured in degrees from the equatorial limbs, and the distances of the points of limb observations measured from the centre of the solar disc and expressed as decimals of the radius. The duration of a limb exposure is denoted by l seconds, and blended with the spectra of the limbs in turn was an exposure of c seconds on the spectrum of the centre of the solar disc, the values of l and c being given, for the different exposures on each plate, in columns headed (1) to (9). Values are also given in these columns of R , which denotes the computed ratio of density of the photographic deposit produced by the continuous spectrum of a limb to the total photographic density produced by the blended continuous spectra of limb and centre. From additional exposures of limb and centre, separately, on plates L914 to L917, it was estimated that equal photographic densities resulted from exposures of 50 seconds and 21 seconds on continuous spectra of limb, and centre, respectively, of the solar disc. The brightness of the centre is 1.8 times that of a point 0.97 of the radius from the centre of the solar disc for radiation about $\lambda 5600$, (plates L911 to L917) and 1.6 times that of a point 0.91 from the centre of the disc² (L854). Consequently from Schwarzschild's formula, which is a sufficiently close approximation,

¹Jour. R.A.S.C., Vol. X, 201-219, 1916.

²The Sun, Charles G. Abbot, p. 107..

$50^p = 1.8 \times 21^p$, and hence $p = 0.7$ for the Cramer Iso-Process plates employed. From this it appears that

$$R = \frac{c_1^{0.7}}{(c_1 + c)^{0.7}} = \frac{l^{0.7}}{(l + l_1)^{0.7}}$$

where $1.8c_1^{0.7} = l^{0.7}$, and $l_1^{0.7} = 1.8c^{0.7}$

Fourfold enlargements from narrow strips of the plates including the six spectrum lines measured, are reproduced in Figure 20. The gradual lessening of the displacements of the spectrum lines in the middle strip from those in the strip on either side, in progressing from observations (1) to (9), is noticeable particularly in those plates taken at the lower latitudes where the displacements are greater.

The means of the measurements, "violet right" and "violet left," for each observer are given in the Tables (a, b, c) and (α, β, γ), and means of these again in Tables II and X.

The measurements by each observer, of Plate L854, in Tables II (a) and II (α) and their means in Table II (a, α), show that, for the various degrees of blending of the spectrum of the centre of the solar disc with the spectra of the east and west equatorial limbs, the amount of lessening of the displacement of a line in the limb spectra due to the solar rotation, varies from line to line depending on the intensity, being greater for the weak than for the strong lines. This is more definitely expressed by the means of the weak and of the strong in Tables II (b) and II (β) and their means in II (b, β); and by these values reduced to a unity basis in II (c) and II (γ) and their means in II (c, γ). Similar differential effects of blending are apparent in the measurements of Plates L911 to L917 which have a greater range in the proportions of blending than Plate L854, and which also present results for a considerable range of displacements of the lines in the limb spectra,—namely the rotation displacements for latitudes from 0° to 80° . Means of the measurements of these plates by each observer are given in Tables X (a, b, c) and X (α, β, γ) and means of these means in Table X. These results are in turn reduced to a unity basis in Tables XI (a, b, c) and XI (α, β, γ) and XI, respectively.

It is seen from the means in Table X, that there is for the value $R = 1.00$, a difference in displacement, depending on the intensity of the spectrum line, similar to that found for the various degrees of blending (*i.e.*, for the various values of R). In other words, there appears to be, in the actual measures of the displacements due to solar rotation, a variation with intensity similar to that produced by blended spectra. Since the plates were taken on hazy days, it is possible that the blended spectrum of haze produced some or all of the differential effects in the columns headed $R = 1.00$,—effects similar to those obtained from various series of observations of the solar rotation. By reducing the values for each line to unity (Table XI, column headed $R = 1.00$) this initial effect is eliminated, and it is seen that the differential effect remains. This is more apparent from the charts in Figure 21, the values for strong and weak lines being indicated by large and small circles, respectively, and their means by the black circles.

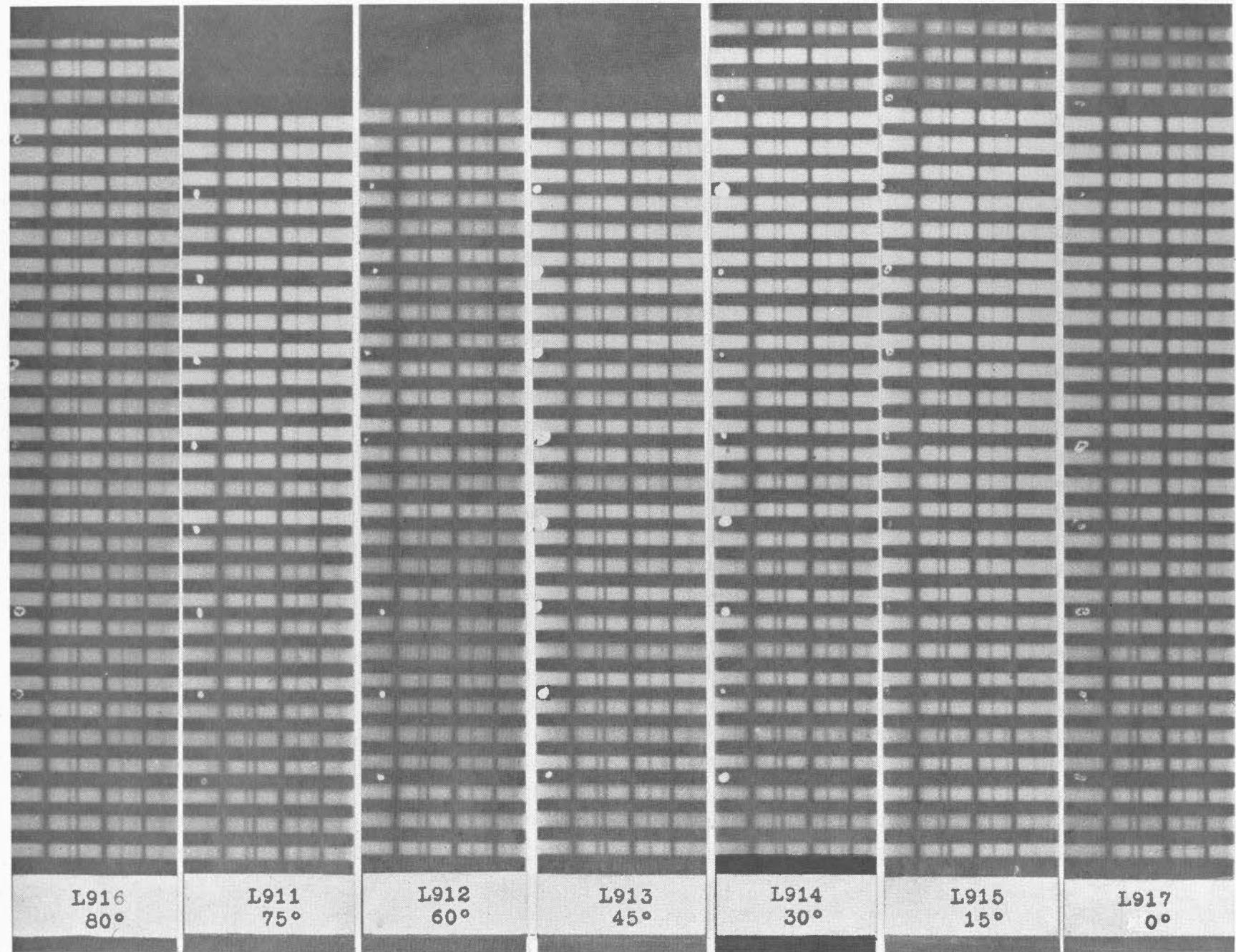


Figure 20—Fourfold Enlargements from the Plates including the six Spectrum Lines measured.

TABLE I.—OBSERVATIONAL DATA.

Plate	Position Angle	Limb Distance	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
			l	R	l	R	l	R	l	R	l	R
L854.....	0°	0.91	40 0	39 1	38 2	36 4	32 8	28 12				
			R=1.00	0.89	0.83	0.74	0.62	0.54				
L916.....	80°	0.97	50 0	45 3.5	40 7	35 10.5	30 14	25 17.5	23 21	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	
L911.....	75°	0.97	50 0	45 3.5	40 7	35 10.5	30 15.5	25 17.5	23 23.5	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.58	0.51	0.43	0.33	0.24	
L912.....	60°	0.97	50 3.5	50 0	40 7	35 10.5	30 14	20 21	25 17.5	15 24.5	10 28	
			R=0.90	1.00	0.79	0.69	0.60	0.42	0.51	0.33	0.24	
L913.....	45°	0.97	50 0	45 3.5	40 7	35 10.5	30 14	25 17.5	20 21	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	
L914.....	30°	0.97	50 0	45 3.5	40 7	35 10.5	30 14	25 17.5	20 21	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	
L915.....	15°	0.97	50 0	45 3.5	40 7	35 10.5	30 14	25 17.5	20 21	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	
L917.....	0°	0.97	50 0	45 3.5	40 7	35 10.5	30 14	25 17.5	20 21	15 24.5	10 28	
			R=1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	

Note.—The durations in seconds of the exposures to limb and centre spectra are denoted by l and c , respectively. R is the computed ratio of density of the continuous spectrum from the limb exposure to the total density of the exposures of limb and centre.

TABLE II. (a, b, c)

Observation:—L854, (1) to (6). Spectra of solar limbs at 0° , blended with spectrum of centre of solar disc.

Measurement:—By De Lury, 2 settings of spider-thread on each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km:sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.795.

λ	El., I	R = 1.00	0.89	0.83	0.74	0.62	0.54	Means 0.72
(a)								
5,586.991.....	Fe 7	1.530	1.673	1.564	1.565	1.467	0.960	1.446
5,587.800.....	Fe 0	1.922	1.613	1.130	1.467	1.192	0.658	1.212
5,588.084.....	Ni 1	1.986	1.643	1.547	1.641	1.090	0.783	1.341
5,588.985, s.....	Ca 6	1.814	1.545	1.552	1.603	1.179	0.879	1.352
5,589.582.....	Ni 0	1.803	1.650	1.556	1.250	0.992	0.958	1.281
5,590.343, s.....	Ca 3	1.713	1.735	1.564	1.601	1.284	0.954	1.428
Means.....	2.8	1.795	1.643	1.485	1.521	1.201	0.865	1.343
(b)								
3 weak lines.....	0.3	1.904	1.635	1.411	1.453	1.091	0.800	1.278
3 strong lines.....	5.3	1.686	1.651	1.560	1.590	1.310	0.931	1.409
(c)								
3 weak lines.....	0.3	1.06	0.91	0.79	0.81	0.61	0.45	0.71
3 strong lines.....	5.3	0.94	0.92	0.87	0.89	0.73	0.52	0.78
Means.....	2.8	1.00	0.92	0.83	0.85	0.67	0.48	0.75

TABLE II, (α , β , γ)

Observation:—L854, (1) to (6). Spectra of solar limbs at 0° , blended with spectrum of centre of solar disc.

Measurement:—By O'Connor, 2 settings of spider-thread on each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km/sec. (β) Means of (a) grouped as to intensity. (γ) Means of (β) divided by 1.750.

λ	El., I	R =	1.00	.089	0.83	0.74	0.62	0.54	Means 0.72
(a)									
5,586.991.....	Fe 7	1.647	1.630	1.556	1.575	1.365	1.037	1.433	
5,587.800.....	Fe 0	1.809	1.573	1.301	1.522	1.068	0.668	1.226	
5,588.084.....	Ni 1	1.728	1.575	1.499	1.535	1.117	0.883	1.322	
5,588.985, s.....	Ca 6	1.771	1.567	1.515	1.498	1.171	0.958	1.342	
5,589.582.....	Ni 0	1.797	1.675	1.692	1.535	1.135	1.005	1.409	
5,590.343, s.....	Ca 3	1.745	1.660	1.464	1.320	1.169	0.934	1.309	
Means.....	2.8	1.750	1.613	1.504	1.498	1.171	0.914	1.340	
(β)									
3 weak lines.....	0.3	1.778	1.608	1.497	1.531	1.107	0.852	1.319	
3 strong lines.....	5.3	1.721	1.619	1.512	1.464	1.235	0.976	1.361	
(γ)									
3 weak lines.....	0.3	1.02	0.92	0.85	0.87	0.63	0.49	0.75	
3 strong lines.....	5.3	0.98	0.92	0.86	0.84	0.71	0.56	0.78	
Means.....	2.8	1.00	0.92	0.85	0.86	0.67	0.53	0.77	

TABLE III

Observation:—L854 (1) to (6).

Measurement:—De Lury and O'Connor.

Computation:—Means of Tables. II (a, b, c) and II (α , β , γ)

TABLE III. (a, b, c)

Observation:—L916, (1) to (9), Spectra of solar limbs at 80° , blended with spectrum of centre of solar disc.

Measurement:—By De Lury, 2 settings on each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km/sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 0.149.

λ	El.	I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe	7	0.038	0.206	0.081	0.008	0.049	-0.066	0.138	0.040	-0.064	0.049
5,587.800.....	Fe	0	0.198	0.077	0.209	-0.234	0.042	-0.098	-0.021	-0.147	-0.126	-0.037
5,588.084.....	Ni	1	0.153	0.017	0.064	-0.115	0.006	-0.221	0.098	-0.104	0.098	-0.020
5,588.985, s.....	Ca	6	0.174	0.143	0.253	0.053	0.021	-0.104	0.251	-0.028	0.023	0.076
5,589.582.....	Ni	0	0.057	-0.045	0.094	0.102	0.240	-0.221	0.345	-0.092	-0.083	0.042
5,590.343, s.....	Ca	3	0.275	0.091	0.241	0.006	0.191	-0.026	0.264	-0.126	0.125	0.096
Means.....		2.8	0.149	0.081	0.157	-0.030	0.091	-0.123	0.179	-0.076	-0.005	0.034
(b)												
3 weak lines.....		0.3	0.136	0.016	0.122	-0.082	0.096	-0.180	0.140	-0.114	-0.037	-0.005
3 strong lines.....		5.3	0.162	0.147	0.192	0.022	0.087	-0.065	0.218	-0.038	0.028	0.074
(c)												
3 weak lines.....		0.3	0.91	0.11	0.82	-0.55	0.64	-1.21	0.94	-0.76	-0.25	0.03
3 strong lines.....		5.3	1.09	0.99	1.29	0.15	0.58	-0.44	1.46	-0.25	0.19	0.50
Means.....		2.8	1.00	0.54	1.05	-0.20	0.61	-0.83	1.20	-0.51	-0.03	0.26

TABLE III, (α , β , γ)

Observation:—L916, (1) to (9) Spectra of solar limbs at 80° , blended with spectrum of centre of solar disc.

Measurement:—By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity.
(c) Means of (b) divided by 0.147.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.087	0.234	0.151	-0.166	0.092	-0.038	-0.008	-0.096	0.051	0.028	
5,587.800.....	Fe 0	0.166	0.040	0.231	-0.219	0.036	-0.055	-0.004	-0.109	0.045	-0.005	
5,588.084.....	Ni 1	0.236	0.130	0.194	-0.126	0.062	-0.185	0.204	-0.174	0.051	0.020	
5,588.985, s.....	Ca 6	0.151	0.164	0.266	-0.043	0.021	-0.066	0.115	-0.077	0.047	0.064	
5,589.582.....	Ni 0	0.049	-0.108	0.094	-0.064	0.128	-0.183	0.187	-0.142	0.060	-0.003	
5,590.343, s.....	Ca 3	0.191	0.172	0.191	-0.109	0.138	-0.143	0.136	-0.121	0.104	0.046	
Means.....		2.8	0.147	0.105	0.188	-0.107	0.080	-0.112	0.105	-0.120	0.060	0.025
(b)												
3 weak lines.....		0.3	0.150	0.021	0.173	-0.136	0.075	-0.141	0.129	-0.142	0.052	0.004
3 strong lines.....		5.3	0.143	0.190	0.203	-0.077	0.084	-0.082	0.081	-0.098	0.067	0.046
(c)												
3 weak lines.....		0.3	1.02	0.14	1.18	-0.93	0.51	-0.96	0.88	-0.97	0.35	0.03
3 strong lines.....		5.3	0.97	1.29	1.38	-0.52	0.57	-0.56	0.55	-0.67	0.46	0.31
Means.....		2.8	1.00	0.71	1.28	-0.73	0.54	-0.76	0.71	-0.82	0.41	0.17

TABLE IV, (a, b, c)

Observation:—L911, (1) to (9) Spectra of solar limbs at 75° , blended with spectrum of centre of solar disc.

Measurement:—By De Lury, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 0.366.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.58	0.51	0.43	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.479	0.192	0.049	0.196	0.126	0.166	-0.044	0.209	0.045	0.117	
5,587.800.....	Fe 0	0.257	0.241	0.226	0.287	0.177	0.004	0.038	0.115	-0.089	0.125	
5,588.084.....	Ni 1	0.389	0.279	0.028	0.266	-0.040	0.057	0.117	0.081	0.015	0.100	
5,588.985, s.....	Ca 6	0.547	0.375	0.240	0.251	0.158	0.000	0.121	0.074	0.111	0.166	
5,589.582.....	Ni 0	0.264	0.149	0.375	0.185	0.108	0.002	0.177	0.134	-0.294	0.104	
5,590.343, s.....	Ca 3	0.258	0.451	0.221	0.211	0.100	0.168	0.028	0.106	0.087	0.171	
Means.....		2.8	0.366	0.281	0.190	0.233	0.105	0.066	0.073	0.120	-0.021	0.130
(b)												
3 weak lines.....		0.3	0.303	0.223	0.210	0.246	0.082	0.021	0.110	0.110	-0.123	0.110
3 strong lines.....		5.3	0.428	0.339	0.170	0.219	0.128	0.111	0.035	0.130	0.081	0.151
(c)												
3 weak lines.....		0.3	0.83	0.61	0.57	0.67	0.22	0.06	0.30	0.30	-0.34	0.30
3 strong lines.....		5.3	1.17	0.93	0.46	0.60	0.35	0.30	0.10	0.35	0.22	0.41
Means.....		2.8	1.00	0.77	0.52	0.63	0.29	0.18	0.20	0.33	-0.06	0.35

TABLE IV, (α , β , γ)

Observation:—L911, (1) to (9) Spectra of solar limbs at 75° , blended with spectrum of centre of solar disc.

Measurement: By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation: (a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 0.357.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.58	0.51	0.43	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.553	0.304	0.238	0.328	0.140	0.153	0.145	0.138	0.130	0.197	
5,587.800.....	Fe 0	0.258	0.298	0.321	0.357	0.158	0.228	0.038	0.151	0.094	0.206	
5,588.084.....	Ni 1	0.273	0.317	0.264	0.198	0.132	0.081	0.143	0.121	0.104	0.170	
5,588.985, s.....	Ca 6	0.330	0.347	0.236	0.328	0.249	0.132	0.160	0.168	0.077	0.212	
5,589.582.....	Ni 0	0.268	0.349	0.217	0.240	0.196	0.151	0.228	0.251	0.055	0.211	
5,590.343, s.....	Ca 3	0.460	0.285	0.208	0.234	0.130	0.096	0.147	0.138	0.047	0.161	
Means.....		2.8	0.357	0.317	0.247	0.281	0.168	0.140	0.144	0.161	0.085	0.193
(b)												
3 weak lines.....		0.3	0.267	0.321	0.267	0.265	0.162	0.153	0.136	0.174	0.084	0.196
3 strong lines.....		5.3	0.448	0.312	0.227	0.297	0.173	0.127	0.151	0.148	0.085	0.190
(c)												
3 weak lines.....		0.3	0.75	0.90	0.75	0.74	0.45	0.43	0.38	0.49	0.24	0.55
3 strong lines.....		5.3	1.25	0.87	0.65	0.83	0.48	0.36	0.42	0.41	0.24	0.53
Means.....		2.8	1.00	0.89	0.69	0.79	0.47	0.39	0.40	0.45	0.24	0.54

TABLE V, (a, b, c)

Observation:—L912, (1) to (9). Spectra of solar limbs at 60° , blended with spectrum of centre of solar disc.

Measurement:—By DeLury, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Mean of (b) divided by 0.660.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.779	0.805	0.622	0.328	0.404	0.281	0.175	0.102	-0.062	0.332	
5,587.800.....	Fe 0	0.526	0.800	0.683	0.115	0.428	0.017	0.115	0.072	-0.108	0.265	
5,588.084.....	Ni 1	0.545	0.628	0.492	0.243	0.109	-0.028	0.059	0.070	0.053	0.203	
5,588.985, s.....	Ca 6	0.794	0.519	0.492	0.407	0.398	0.253	0.219	0.008	-0.008	0.286	
5,589.582.....	Ni 0	0.681	0.643	0.704	0.583	0.351	0.275	0.453	-0.042	0.011	0.372	
5,590.343, s.....	Ca 3	0.634	0.592	0.613	0.300	0.266	0.036	0.232	-0.057	-0.085	0.237	
Means.....		2.8	0.660	0.665	0.601	0.329	0.326	0.139	0.209	0.026	-0.033	0.283
(b)												
3 weak lines.....		0.3	0.584	0.690	0.626	0.314	0.296	0.088	0.209	0.033	-0.015	0.280
3 strong lines,		5.3	0.736	0.639	0.576	0.345	0.356	0.190	0.209	0.018	-0.052	0.286
(c)												
3 weak lines.....		0.3	0.88	1.05	0.95	0.48	0.45	0.13	0.32	0.05	-0.02	0.42
3 strong lines.....		5.3	1.12	0.97	0.87	0.52	0.54	0.29	0.32	0.03	-0.08	0.43
Means.....		2.8	1.00	1.01	0.91	0.50	0.49	0.21	0.32	0.04	-0.05	0.43

TABLE V, (α , β , γ)

Observation:—L912 (1) to (9). Spectra of solar limbs at 60° , blended with spectrum of centre of solar disc.
Measurement:—By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.
Computation: (a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 0.609.

λ	El., I	R=	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.651	0.632	0.651	0.473	0.336	0.274	0.257	0.175	0.038	0.354	
5,587.800.....	Fe 0	0.411	0.553	0.389	0.230	0.315	0.170	0.157	0.089	-0.013	0.236	
5,588.084.....	Ni 1	0.624	0.647	0.426	0.338	0.234	0.087	0.125	0.060	0.019	0.242	
5,588.985, s.....	Ca 6	0.660	0.547	0.568	0.264	0.357	0.209	0.192	0.102	0.047	0.286	
5,589.582.....	Ni 0	0.587	0.565	0.538	0.270	0.430	0.228	0.417	0.034	-0.147	0.292	
5,590.343, s.....	Ca 3	0.719	0.630	0.436	0.313	0.292	0.196	0.194	0.042	-0.032	0.259	
Means.....		2.8	0.609	0.596	0.501	0.315	0.327	0.194	0.224	0.084	-0.015	0.278
(b)												
3 weak lines.....		0.3	0.541	0.589	0.451	0.279	0.326	0.162	0.233	0.061	-0.047	0.257
3 strong lines.....		5.3	0.677	0.603	0.552	0.350	0.328	0.226	0.214	0.106	0.018	0.300
(c)												
3 weak lines.....		0.3	0.89	0.97	0.74	0.46	0.53	0.27	0.38	0.10	-0.08	0.42
3 strong lines.....		5.3	0.11	0.99	0.91	0.57	0.54	0.37	0.35	0.17	0.03	0.49
Means.....		2.8	1.00	0.98	0.82	0.52	0.54	0.32	0.37	0.14	-0.02	0.46

TABLE VI, (a, b, c)

Observation:—L913, (1) to (9). Spectra of solar limbs at 45° , blended with spectrum of centre of solar disc.
Measurement: By DeLury, 2 settings each line, each way, plate right and plate left, and means taken.
Computation: (a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.096.

λ	El., I	R=	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	0.994	0.932	1.024	0.649	0.762	0.381	0.274	0.179	0.034	0.529	
5,587.800.....	Fe 0	1.152	0.830	0.598	0.630	0.183	0.200	0.136	-0.040	-0.066	0.309	
5,588.084.....	Ni 1	1.164	0.777	0.558	0.443	0.189	0.228	0.121	-0.068	0.075	0.290	
5,588.985, s.....	Ca 6	1.115	1.011	0.798	0.696	0.515	0.179	0.115	0.068	0.292	0.459	
5,589.582.....	Ni 0	1.005	1.018	0.709	0.456	0.528	-0.009	0.108	-0.032	-0.142	0.330	
5,590.343, s.....	Ca 3	1.149	1.075	0.826	0.400	0.338	0.275	0.168	0.043	0.091	0.402	
Means.....		2.8	1.096	0.941	0.752	0.546	0.419	0.209	0.153	0.025	0.047	0.387
(b)												
3 weak lines.....		0.3	1.107	0.875	0.622	0.510	0.300	0.140	0.122	-0.047	-0.044	0.310
3 strong lines.....		5.3	1.086	1.006	0.883	0.582	0.538	0.278	0.186	0.097	0.139	0.463
(c)												
3 weak lines.....		0.3	1.01	0.80	0.57	0.47	0.27	0.13	0.11	-0.04	-0.04	0.28
3 strong lines.....		5.3	0.99	0.92	0.81	0.53	0.49	0.25	0.17	0.09	0.13	0.42
Means.....		2.8	1.00	0.86	0.69	0.50	0.38	0.19	0.14	0.02	0.04	0.35

TABLE VI, (α , β , γ)

Observation:—L913, (1) to (9). Spectra of solar limbs at 45° , blended with spectrum from centre of solar disc.

Measurement:—By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation: (a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.165.

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a)												
5,586.991.....	Fe 7	1.141	1.059	0.895	0.887	0.730	0.504	0.324	0.226	0.094	0.590	
5,587.800.....	Fe 0	1.177	0.860	0.630	0.616	0.432	0.404	0.192	0.040	0.074	0.409	
5,588.084.....	Ni 1	1.177	0.866	0.566	0.681	0.074	0.434	0.208	0.066	0.094	0.373	
5,588.985, s.....	Ca 6	1.118	0.948	0.606	0.986	0.515	0.402	0.266	0.140	0.138	0.500	
5,589.582.....	Ni 0	1.171	1.024	0.572	0.598	0.498	0.309	0.232	0.138	0.023	0.424	
5,590.343, s.....	Ca 3	1.197	0.918	0.780	0.784	0.622	0.345	0.226	0.109	0.087	0.484	
Means.....		2.8	1.165	0.946	0.675	0.759	0.478	0.400	0.241	0.120	0.085	0.463
(b)												
3 weak lines.....		0.3	1.175	0.917	0.589	0.632	0.335	0.382	0.211	0.081	0.064	0.402
3 strong lines.....		5.3	1.155	0.975	0.760	0.886	0.622	0.417	0.272	0.158	0.106	0.525
(c)												
3 weak lines.....		0.3	1.01	0.79	0.51	0.54	0.29	0.33	0.18	0.07	0.05	0.34
3 strong lines.....		5.3	0.99	0.84	0.65	0.76	0.53	0.36	0.23	0.14	0.09	0.45
Means.....		2.8	1.00	0.81	0.58	0.65	0.41	0.34	0.21	0.10	0.07	0.40

TABLE VII, (a, b, c)

Observation: L914, (1) to (9). Spectra of solar limbs at 30° , blended with spectrum of centre of solar disc.

Measurement:—By DeLury, 2 settings each line each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.404.

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a)												
5,586.991.....	Fe 7	1.398	1.215	1.075	0.805	0.568	0.519	0.449	0.423	0.070	0.640	
5,587.800.....	Fe 0	1.356	0.971	1.051	0.274	0.074	0.004	0.192	-0.002	0.009	0.322	
5,588.084.....	Ni 1	1.405	1.117	0.864	0.702	0.372	0.147	0.113	0.032	0.087	0.429	
5,588.985, s.....	Ca 6	1.424	1.145	1.064	0.717	0.423	0.400	0.115	0.241	0.019	0.515	
5,589.582.....	Ni 0	1.465	1.215	0.930	0.649	0.392	0.224	-0.057	0.015	-0.096	0.409	
5,590.343, s.....	Ca 3	1.379	1.132	0.971	0.592	0.336	0.279	0.064	0.285	0.064	0.465	
Means.....		2.8	1.404	1.132	0.992	0.623	0.361	0.262	0.146	0.166	0.025	0.463
(b)												
3 weak lines.....		0.3	1.409	1.101	0.948	0.542	0.279	0.125	0.082	0.015	0.000	0.387
3 strong lines.....		5.3	1.400	1.164	1.037	0.705	0.442	0.399	0.209	0.316	0.051	0.540
(c)												
3 weak lines.....		0.3	1.00	0.78	0.67	0.39	0.20	0.09	0.06	0.01	0.00	0.28
3 strong lines.....		5.3	1.00	0.83	0.74	0.50	0.31	0.28	0.15	0.22	0.04	0.38
Means.....		2.8	1.00	0.81	0.71	0.44	0.26	0.19	0.10	0.12	0.02	0.33

TABLE VII, (α , β , γ)

Observation: L914, (1) to (9). spectra of solar limbs at 30° , blended with spectrum of centre of solar disc.

Measurement: By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.425.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	1.394	1.034	0.977	0.928	0.560	0.560	0.283	0.298	0.192	0.192	0.604
5,587.800.....	Fe 0	1.471	0.943	0.811	0.504	0.047	0.151	0.175	0.085	-0.064	0.332	
5,588.084.....	Ni 1	1.313	1.083	0.779	0.600	0.311	0.133	0.119	0.126	0.072	0.400	
5,588.985, s.....	Ca 6	1.424	1.154	0.983	0.694	0.434	0.311	0.241	0.224	0.072	0.514	
5,589.582.....	Ni 0	1.454	1.205	0.909	0.528	0.247	0.226	0.108	0.140	0.066	0.429	
5,590.343, s.....	Ca 3	1.492	1.194	0.909	0.700	0.262	0.294	0.166	0.268	0.074	0.483	
Means.....		2.8	1.425	1.102	0.895	0.659	0.310	0.276	0.182	0.190	0.069	0.460
(b)												
3 weak lines.....		0.3	1.413	1.077	0.833	0.544	0.202	0.163	0.134	0.117	0.025	0.387
3 strong lines.....		5.3	1.437	1.127	0.956	0.774	0.419	0.388	0.230	0.263	0.113	0.534
(c)												
3 weak lines.....		0.3	0.99	0.76	0.58	0.38	0.14	0.11	0.09	0.08	0.02	0.027
3 strong lines.....		5.3	1.01	0.79	0.67	0.54	0.29	0.27	0.16	0.18	0.08	0.037
Means.....		2.8	1.00	0.77	0.63	0.46	0.22	0.19	0.13	0.13	0.05	0.32

TABLE VIII, (a, b, c)

Observation:—L915, (1) to (9). Spectra of solar limbs, at 15° , blended with spectrum of centre of solar disc

Measurement:—By DeLury, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expresed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.744.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	1.884	1.763	1.424	0.928	1.047	0.481	0.174	0.274	0.102	0.774	
5,587.800.....	Fe 0	1.379	1.375	1.203	0.702	0.641	0.255	-0.077	0.028	0.002	0.516	
5,588.084.....	Ni 1	1.905	1.399	1.303	0.575	0.347	0.025	-0.034	-0.053	-0.100	0.433	
5,588.985, s.....	Ca 6	1.675	1.596	1.283	0.866	0.754	0.406	0.234	0.059	0.008	0.650	
5,589.582.....	Ni 0	1.856	1.364	1.081	0.877	0.743	0.381	-0.051	0.292	-0.223	0.558	
5,590.343, s.....	Ca 3	1.767	1.518	1.203	0.798	0.481	0.098	0.019	0.032	-0.119	0.504	
Means.....		2.8	1.744	1.503	1.250	0.791	0.669	0.274	0.044	0.105	-0.055	0.573
(b)												
3 weak lines.....		0.3	1.713	1.379	1.196	0.718	0.577	0.220	-0.054	0.089	-0.107	0.502
3 strong lines.....		5.3	1.775	1.626	1.303	0.864	0.761	0.328	0.142	0.122	-0.003	0.643
(c)												
3 weak lines.....		0.3	0.98	0.79	0.69	0.41	0.33	0.13	-0.03	0.05	-0.06	0.29
3 strong lines.....		5.3	1.02	0.93	0.75	0.50	0.44	0.19	0.08	0.07	0.00	0.37
Means.....		2.8	1.00	0.86	0.72	0.45	0.38	0.16	0.03	0.06	-0.03	0.33

TABLE VIII, (α , β , γ)

Observation:—L915 (1) to (9). Spectra of solar limbs at 15° , blended with spectrum of centre of solar disc.

Measurement:—By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km:sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.739.

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)											
5,586.991.....	Fe 7	1.805	1.558	1.379	0.943	0.802	0.307	0.324	0.185	0.075	0.697
5,587.800.....	Fe 0	1.707	1.367	1.162	0.828	0.604	0.343	0.070	-0.247	0.109	0.530
5,588.084.....	Ni 1	1.778	1.482	1.264	0.849	0.560	0.251	-0.077	-0.032	0.051	0.543
5,588.985, s.....	Ca 6	1.686	1.533	1.333	0.722	0.628	0.240	0.202	0.002	0.066	0.591
5,589.582.....	Ni 0	1.665	1.462	1.088	0.788	0.570	0.349	0.221	0.281	0.059	0.602
5,590.343, s.....	Ca 3	1.790	1.597	1.209	0.881	0.737	0.360	0.126	0.075	0.042	0.629
Means.....		2.8	1.739	1.500	1.239	0.835	0.650	0.308	0.144	0.044	0.067
(b)											
3 weak lines.....		0.3	1.717	1.437	1.171	0.822	0.578	0.314	0.071	0.001	0.073
3 strong lines.....		5.3	1.760	1.563	1.307	0.849	0.722	0.302	0.217	0.087	0.061
(c)											
3 weak lines.....		0.3	0.99	0.83	0.67	0.47	0.33	0.18	0.04	0.00	0.04
3 strong lines.....		5.3	1.01	0.90	0.75	0.49	0.42	0.17	0.12	0.05	0.04
Means.....		2.8	1.00	0.86	0.71	0.48	0.37	0.18	0.08	0.03	0.04

TABLE IX, (a, b, c)

Observation:—L917 (1) to (9). Spectra of solar limbs at 0° , blended with spectrum of centre of solar disc.

Measurement:—By DeLury, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km:sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.775.

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)											
5,586.991.....	Fe 7	1.803	1.671	1.471	1.030	1.058	0.485	0.649	0.470	0.285	0.890
5,587.800.....	Fe 0	1.854	1.301	1.028	0.785	0.645	-0.023	0.428	0.189	0.170	0.565
5,588.084.....	Ni 1	1.601	1.581	1.060	0.962	0.547	0.043	0.345	-0.132	0.130	0.569
5,588.985, s.....	Ca 6	1.850	1.777	1.320	0.920	0.822	0.170	0.426	0.217	0.240	0.737
5,589.582.....	Ni 0	1.688	1.811	1.026	0.624	0.647	0.198	0.311	-0.198	0.208	0.578
5,590.343, s.....	Ca 3	1.856	1.279	1.086	0.594	0.628	0.241	0.370	0.055	0.147	0.551
Means.....		2.8	1.775	1.570	1.167	0.819	0.725	0.186	0.422	0.100	0.196
(b)											
weak lines.....		0.3	1.714	1.564	1.038	0.790	0.613	0.073	0.361	-0.047	0.169
3 strong lines.....		5.3	1.836	1.576	1.296	0.848	0.836	0.299	0.482	0.247	0.224
(c)											
3 weak lines.....		0.3	0.96	0.88	0.58	0.44	0.35	0.04	0.20	-0.03	0.10
3 strong lines.....		5.3	1.03	0.89	0.73	0.48	0.47	0.17	0.27	0.14	0.13
Means.....		2.8	1.00	0.88	0.65	0.46	0.41	0.10	0.24	0.06	0.11

TABLE IX, (α , β , γ)

Observation:—L917 (1) to (9). Spectra of solar limbs at 0° , blended with spectrum of centre of solar disc.

Measurement:—By O'Connor, 2 settings each line, each way, plate right and plate left, and means taken.

Computation:—(a) Half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.743.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)												
5,586.991.....	Fe 7	1.811	1.567	1.350	1.071	0.751	0.409	0.585	0.311	0.160	0.776	
5,587.800.....	Fe 0	1.664	1.369	0.971	0.762	0.523	-0.075	0.285	0.149	0.147	0.516	
5,588.084.....	Ni 1	1.730	1.507	1.120	0.617	0.494	-0.057	0.347	0.009	0.021	0.508	
5,588.985, s.....	Ca 6	1.773	1.564	1.217	0.830	0.749	0.094	0.477	0.132	0.179	0.655	
5,589.582.....	Ni 0	1.814	1.552	0.994	0.836	0.453	0.140	0.330	0.153	0.358	0.564	
5,590.343, s.....	Ca 3	1.669	1.498	1.088	0.762	0.666	0.181	0.358	0.089	0.070	0.589	
Means.....		2.8	1.743	1.509	1.123	0.813	0.606	0.115	0.397	0.090	0.156	0.601
(b)												
3 weak lines.....		0.3	1.736	1.476	1.028	0.738	0.491	0.003	0.321	0.002	0.175	0.529
3 strong lines.....		5.3	1.751	1.543	1.218	0.888	0.722	0.228	0.473	0.177	0.136	0.673
(γ)												
3 weak lines.....		0.3	1.00	0.85	0.59	0.42	0.28	0.00	0.18	0.00	0.10	0.30
3 strong lines.....		5.3	1.00	0.89	0.70	0.51	0.41	0.13	0.27	0.10	0.08	0.39
Means.....		2.8	1.00	0.87	0.64	0.47	0.35	0.07	0.23	0.05	0.09	0.34

TABLE X, (a, b, c)

Observation:—L911 to L917.

Measurement: By DeLury.

Computation: (a) Means of half-displacements expressed in km:sec. (b) Means of (a) grouped as to intensity. (c) Means of (b) divided by 1.028.

λ	El.,	I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56
(a)													
5,586.991.	Fe	7	1.054	0.969	0.821	0.563	0.573	0.321	0.259	0.242	0.059	0.476	
5,587.800.	Fe	0	0.960	0.799	0.714	0.366	0.313	0.051	0.136	0.031	-0.030	0.295	
5,588.084.	Ni	1	1.023	0.828	0.624	0.439	0.219	0.036	0.117	-0.025	0.051	0.286	
5,588.985, s.	Ca	6	1.083	0.938	0.779	0.559	0.442	0.186	0.212	0.091	0.098	0.413	
5,589.582.	Ni	0	1.002	0.879	0.703	0.497	0.430	0.121	0.184	0.011	-0.088	0.342	
5,590.343, s.	Ca	3	1.045	0.876	0.739	0.414	0.334	0.153	0.164	0.048	0.044	0.347	
Means.....		2.8	1.028	0.882	0.730	0.473	0.385	0.145	0.175	0.067	0.022	0.360	
(b)													
3 weak lines.....		0.3	0.995	0.835	0.680	0.434	0.320	0.070	0.139	0.006	-0.022	0.309	
3 strong lines.....		5.3	1.060	0.928	0.780	0.512	0.450	0.219	0.211	0.127	0.067	0.412	
(c)													
3 weak lines.....		0.3	0.967	0.812	0.661	0.422	0.311	0.068	0.135	0.006	-0.021	0.300	
3 strong lines.....		5.3	1.030	0.902	0.758	0.498	0.437	0.213	0.205	0.123	0.065	0.400	
Means.....		2.8	0.999	0.857	0.711	0.460	0.374	0.141	0.170	0.065	0.022	0.350	

TABLE X, (α , β , γ)*Observation:*—L911 to L917.*Measurement:*—By O'Connor.*Computation:* (a) Means of half-displacements expressed in km: sec. (b) Means of (a) grouped as to intensity. (γ) Means of (b) divided by 1.026.

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a)												
5,586.991.....	Fe 7	1.063	0.913	0.806	0.638	0.487	0.311	0.271	0.177	0.106	0.464	
5,587.800.....	Fe 0	0.979	0.776	0.645	0.440	0.302	0.167	0.130	0.023	0.056	0.318	
5,588.084.....	Ni 1	1.019	0.862	0.659	0.451	0.267	0.103	0.153	0.025	0.059	0.322	
5,588.985, s.....	Ca 6	1.020	0.894	0.744	0.552	0.422	0.189	0.236	0.099	0.089	0.403	
5,589.582.....	Ni 0	1.001	0.864	0.630	0.457	0.360	0.174	0.246	0.078	0.068	0.360	
5,590.343, s.....	Ca 3	1.074	0.899	0.689	0.509	0.407	0.190	0.193	0.086	0.056	0.379	
Means.....		2.8	1.026	0.868	0.695	0.508	0.374	0.189	0.205	0.081	0.073	0.374
(b)												
3 weak lines.....		0.3	1.000	0.834	0.645	0.449	0.310	0.148	0.176	0.042	0.061	0.333
3 strong lines.....		5.3	1.053	0.902	0.746	0.567	0.427	0.230	0.233	0.120	0.084	0.415
(γ)												
3 weak lines.....		0.3	0.975	0.813	0.629	0.438	0.302	0.144	0.170	0.041	0.059	0.325
3 strong lines.....		5.3	1.027	0.879	0.727	0.552	0.428	0.224	0.227	0.117	0.082	0.405
Means.....		2.8	1.001	0.846	0.678	0.495	0.359	0.184	0.199	0.079	0.071	0.365

TABLE X

Observation:—L911 to L917.*Measurement:*—DeLury and O'Connor.*Computation:*—Means of Tables, X, (a, b, c), and X, (α , β , γ).

λ	El., I	R = 1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a, a)												
5,586.991.....	Fe 7	1.059	0.941	0.805	0.601	0.530	0.316	0.266	0.210	0.083	0.470	
5,587.800.....	Fe 0	0.970	0.788	0.680	0.403	0.308	0.109	0.133	0.027	0.013	0.307	
5,588.084.....	Ni 1	1.021	0.845	0.642	0.445	0.243	0.070	0.135	0.000	0.055	0.304	
5,588.985, s.....	Ca 6	1.052	0.916	0.762	0.556	0.432	0.188	0.224	0.095	0.094	0.408	
5,589.582.....	Ni 0	1.002	0.872	0.667	0.477	0.395	0.148	0.215	0.042	-0.010	0.351	
5,590.343, s.....	Ca 3	1.060	0.888	0.714	0.462	0.371	0.172	0.179	0.067	0.050	0.363	
Means.....		2.8	1.027	0.875	0.713	0.491	0.380	0.167	0.190	0.074	0.048	0.367
(b, β)												
3 weak lines.....		0.3	0.998	0.835	0.668	0.442	0.315	0.109	0.158	0.024	0.020	0.321
3 strong lines.....		5.3	1.057	0.915	0.763	0.540	0.444	0.225	0.222	0.124	0.076	0.414
(c, γ)												
3 weak lines.....		0.3	0.971	0.812	0.645	0.430	0.306	0.106	0.154	0.023	0.019	0.312
3 strong lines.....		5.3	1.028	0.890	0.742	0.525	0.432	0.219	0.216	0.111	0.074	0.403
Means.....		2.8	1.000	0.851	0.694	0.478	0.369	0.163	0.185	0.067	0.047	0.358

TABLE XI, (a, b, c)

Observation:—L911 to L917.*Measurement:*—DeLury.*Computation:*—Values of Table X (a, b, c) expressed as decimals of first number in each line.

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a)													
5,586.991.....	Fe 7	1.00	0.92	0.78	0.53	0.54	0.30	0.25	0.23	0.06	0.451		
5,587.800.....	Fe 0	1.00	0.83	0.74	0.38	0.33	0.05	0.11	0.03	-0.03	0.307		
5,588.084.....	Ni 1	1.00	0.81	0.61	0.43	0.21	0.04	0.11	-0.02	0.05	0.279		
5,588.985, s.....	Ca 6	1.00	0.87	0.72	0.52	0.41	0.14	0.20	0.08	0.09	0.382		
5,589.582.....	Ni 0	1.00	0.88	0.70	0.50	0.43	0.12	0.19	0.01	-0.09	0.338		
5,590.343, s.....	Ca 3	1.00	0.84	0.71	0.40	0.32	0.15	0.16	0.05	0.04	0.332		
Means.....		2.8	1.00	0.86	0.71	0.46	0.37	0.14	0.17	0.07	0.02	0.350	
(b)													
3 weak lines.....		0.3	1.00	0.84	0.68	0.44	0.32	0.07	0.14	0.01	-0.02	0.311	
3 strong lines.....		5.3	1.00	0.88	0.74	0.48	0.42	0.21	0.20	0.12	0.06	0.389	

TABLE XI (a, β , γ)*Observation:*—L911 to L917.*Measurement:*—O'Conor.*Computation:*—Values of Table X (a, β , γ) expressed as decimals of first number in each line.

λ	El. I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a)													
5,586.991.....	Fe 7	1.00	0.86	0.76	0.60	0.46	0.29	0.25	0.17	0.10	0.436		
5,587.800.....	Fe 0	1.00	0.79	0.66	0.45	0.31	0.17	0.13	0.02	0.06	0.325		
5,588.084.....	Ni 1	1.00	0.85	0.65	0.44	0.26	0.10	0.15	0.02	0.06	0.316		
5,588.985, s.....	Ca 6	1.00	0.88	0.73	0.54	0.41	0.19	0.23	0.10	0.09	0.395		
5,589.582.....	Ni 0	1.00	0.86	0.63	0.45	0.36	0.17	0.25	0.07	0.07	0.360		
5,590.343, s.....	Ca 3	1.00	0.84	0.64	0.47	0.38	0.18	0.18	0.08	0.05	0.353		
Means.....		2.8	1.00	0.85	0.68	0.50	0.36	0.18	0.20	0.08	0.07	0.365	
(b)													
3 weak lines.....		0.3	1.00	0.83	0.65	0.45	0.31	0.15	0.18	0.04	0.06	0.333	
3 strong lines.....		5.3	1.00	0.86	0.71	0.54	0.42	0.22	0.22	0.11	0.08	0.395	

TABLE XI

Observation:—L911 to L917.*Measurement:*—DeLury and O'Connor.*Computation:*—Means of Tables XI, (a, b, c), and XI, (a, β , γ).

λ	El., I	R =	1.00	0.89	0.79	0.69	0.60	0.51	0.42	0.33	0.24	Means 0.56	
(a, a)													
5,586.991.....	Fe 7	1.000	0.890	0.769	0.565	0.500	0.295	0.250	0.200	0.080	0.444		
5,587.800.....	Fe 0	1.000	0.810	0.700	0.415	0.320	0.110	0.120	0.025	0.015	0.316		
5,588.084.....	Ni 1	1.000	0.830	0.630	0.435	0.235	0.070	0.130	0.000	0.055	0.298		
5,588.985, s.....	Ca 6	1.000	0.875	0.725	0.530	0.410	0.165	0.215	0.090	0.090	0.389		
5,589.582.....	Ni 0	1.000	0.870	0.665	0.475	0.395	0.145	0.220	0.040	-0.010	0.349		
5,590.343, s.....	Ca 3	1.000	0.840	0.675	0.435	0.350	0.165	0.170	0.065	0.045	0.343		
Means.....		2.8	1.000	0.855	0.695	0.480	0.365	0.160	0.185	0.075	0.045	0.358	
(b, β)													
3 weak lines.....		0.3	1.000	0.835	0.665	0.445	0.315	0.110	0.160	0.022	0.020	0.322	
3 strong lines.....		5.3	1.000	0.870	0.725	0.510	0.420	0.215	0.210	0.118	0.070	0.392	

Any differences in the effects of blending due to the differences in magnitude of the initial displacements are slight, as is seen from the decimal values in the (c) and (γ) parts of the tables. There may be a slightly greater lessening of the displacements due to blending, for the smaller than for the larger initial displacements.

The cause of the differential effects produced in blendings of spectra and dependent on the intensities of the spectrum lines, is traceable (as pointed out in the earlier measures of these plates, see foot-note on page 41) to the fact that the weak lines are relatively more weakened in the limb spectra than are the stronger lines.

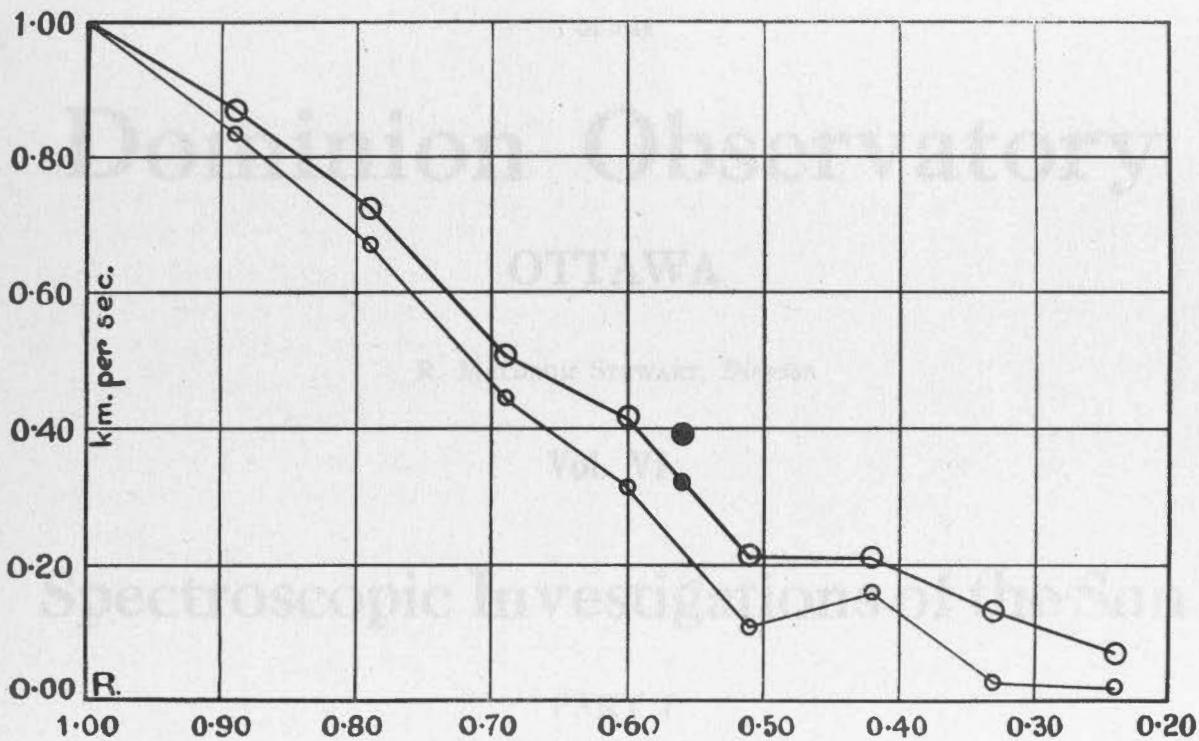


Figure 21—Differential Effects for Strong and Weak Lines in Blended Spectra.

Briefly, the conclusions from the present measurements of blended spectra are:—

- (1) There are differential effects in the blending of limb and centre solar spectra dependent on the intensities of the spectrum lines, and due to variations in the relative intensities of the lines in the two sources.
- (2) Similar differential effects in the unblended spectra are probably due to overlapping spectrum of haze.
- (3) There is possibly a slight difference in the proportion of the lessening of the displacements of the spectrum lines due to blending, dependent on the initial displacements of the lines, being greater for the smaller initial displacements than for the larger.

DOMINION OBSERVATORY,

OTTAWA,

October 12, 1923.

