

R E S U L T S
OF
REFLEX ZENITH TUBE OBSERVATIONS

MADE AT THE
ROYAL OBSERVATORY, GREENWICH,

1 9 0 7 - 1 9 1 1.

(APPENDIX TO GREENWICH OBSERVATIONS, 1912.)



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RESULTS OBTAINED FROM OBSERVATIONS OF ZENITH DISTANCES OF STARS WITH THE REFLEX ZENITH TUBE, 1907-1911.

THE following summary of the results obtained from observations made with the Reflex Zenith Tube covers the period extending from January 1907 to August 24th, 1911, after which date observations with the instrument were discontinued in favour of observations with the Cookson Photographic Floating Zenith Telescope.

The observations made during the years 1907-1909 have been discussed by Mr Eddington in a paper communicated to the Royal Astronomical Society in May 1911 and published in the "*Monthly Notices*" (Vol. LXXI. No. 7). Details are there given of the method employed in deriving the results now printed, and beyond a description of the form in which the results are exhibited no further explanation is necessary except a precise account of the method of weighting.

Table I. gives the final approximation to the star places obtained from the discussion of the observations made in 1907-8-9. These places were used in computing the results of the observations made in 1910-11, but, as mentioned in Mr Eddington's paper, slightly different places were used for the observations made in 1907-9.

Table II. gives for each date the mean of the apparent errors of the zenith distances observed, with the approximate mean zenith distance and effective weight of the number of stars observed; together with the adopted value of the correction for scale when this has been determined.

In forming these means, half weight has been given to stars of magnitude 6.3 and fainter, and to 9 Lacertæ.

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In obtaining the value of the Scale Constant, only stars the more distant north and south of the zenith have been used, the precise selection being sometimes a little arbitrary. If the stars were distributed evenly in zenith distance, the greatest weight, theoretically, would be obtained by comparing the two outer thirds of the range, leaving the middle third unused. With an irregular distribution of stars there is no simple rule, but in case of doubt it is an easy matter to calculate whether the inclusion or exclusion of a star gives the greater weight; and with a little practice the combination of greatest weight is easily recognised.

Table III. gives the mean residuals obtained from the daily results in Table II. after correcting for scale and grouping into periods estimated to be of approximately equal value or weight; and the amount of Latitude Variation at the mean date of each group, as adopted by Prof. Albrecht from the observations of the International Latitude Service, appears in the adjoining column.

In assessing the contributory weight of any individual daily result, attention has been paid to the symmetry of distribution of the stars, and whether, accordingly, the correction for scale is well determined.

TABLE I.—STAR PLACES OF STARS OBSERVED WITH THE REFLEX ZENITH TUBE,
OBTAINED FROM A DISCUSSION OF THE OBSERVATIONS MADE DURING THE YEARS 1907-8-9.

Star's Name.	Approximate R.A.	Zenith Distances, 1910.	Annual Variation.	Star's Name.	Approximate R.A.	Zenith Distances, 1910.	Annual Variation.
	h m				h m		
Groombridge 35.....	0. 12	-32. 38'89	+20.012	γ Draconis.....	17. 54	+ 1. 18'78	- 0.506
Groombridge 58.....	0. 19	+ 2. 38'37	+19.970	Oeltz. Arg. (N.) 17794.....	18. 0	+ 9. 33'81	+ 0.018
Piazzi I. 176.....	1. 45	+ 0. 45'40	+17.858	Oeltz. Arg. (N.) 17865.....	18. 3	+27. 30'39	+ 0.303
9 Aurigæ.....	4. 59	+ 0. 6'41	+ 5.043	Groombridge 2549.....	18. 17	-10. 10'29	+ 1.505
Groombridge 1017.....	5. 39	+ 0. 30'10	+ 1.730	Groombridge 2556.....	18. 19	-13. 13'14	+ 1.669
Groombridge 1024.....	5. 43	+ 0. 38'16	+ 1.386	Groombridge 2559.....	18. 20	+ 1. 7'36	+ 1.756
Groombridge 1034.....	5. 49	+18. 39'33	+ 0.955	Groombridge 2601.....	18. 30	+34. 13'07	+ 2.628
Groombridge 1048.....	5. 53	-24. 10'64	+ 0.580	Groombridge 2612.....	18. 31	+48. 15'89	+ 2.789
35 Camelopardi.....	5. 57	+ 5. 57'43	+ 0.187	Piazzi XVIII. 170.....	18. 37	+38. 1'38	+ 3.320
Groombridge 1103.....	6. 6	-16. 51'47	- 0.640	Lalande 35631.....	18. 56	-47. 36'75	+ 4.912
B. D. + 51° 1185.....	6. 17	-21. 16'25	- 1.513	Groombridge 2753.....	19. 0	+39. 9'58	+ 5.165
Groombridge 1272.....	7. 6	+ 6. 5'55	- 5.723	Groombridge 2778.....	19. 6	+48. 16'49	+ 5.665
Groombridge 1284.....	7. 10	+48. 47'92	- 6.113	Groombridge 2829.....	19. 19	+43. 33'66	+ 6.808
B. D. + 52° 1205.....	7. 17	+35. 6'87	- 6.686	ι^1 Cygni.....	19. 25	+39. 34'21	+ 7.252
Lalande 14549.....	7. 26	+ 1. 48'22	- 7.423	ι^2 Cygni.....	19. 27	+ 3. 37'50	+ 7.587
50 Camelopardi.....	7. 37	-49. 47'20	- 8.296	Piazzi XIX. 211.....	19. 32	-26. 3'13	+ 7.629
27 Lyncis.....	8. 1	+17. 22'62	-10.158	ψ Cygni.....	19. 53	+43. 20'79	+ 9.481
B. F. 1273.....	8. 59	-17. 38'85	-14.185	Groombridge 2990.....	19. 54	-49. 1'61	+ 9.587
f Ursæ Majoris.....	9. 2	+29. 28'59	-14.369	Piazzi XIX. 380.....	19. 56	+19. 53'36	+ 9.788
Oeltz. Arg. (N.) 9659-0-1.....	9. 5	-40. 10'07	-14.520	Groombridge 3036.....	20. 2	+ 6. 12'39	+10.258
Bradley 1306.....	9. 14	+ 9. 56'43	-14.907	Groombridge 3087.....	20. 10	-17. 5'96	+10.748
Groombridge 1542.....	9. 18	+28. 59'62	-15.283	Groombridge 3213.....	20. 28	+31. 32'03	+12.176
θ Ursæ Majoris.....	9. 26	+36. 38'93	-16.283	Piazzi XX. 236.....	20. 32	+ 3. 57'23	+12.356
5 Canum Venaticum.....	12. 19	+35. 0'45	-19.966	Groombridge 3295.....	20. 45	+36. 4'17	+13.062
7 Canum Venaticum.....	12. 25	+33. 18'17	-19.904	Oeltz. Arg. (N.) 21161-2.....	20. 46	+ 5. 55'56	+13.294
Piazzi XIII. 105.....	13. 25	-17. 29'37	-18.752	Oeltz. Arg. (N.) 21182-3.....	20. 46	-29. 51'14	+13.338
Piazzi XIII. 156.....	13. 34	-18. 17'19	-18.387	Groombridge 3311.....	20. 48	+34. 48'54	+13.438
Groombridge 2027.....	13. 35	+46. 59'58	-18.324	Piazzi XX. 412.....	20. 53	-44. 54'67	+13.760
Oeltz. Arg. (N.) 13870-1.....	13. 36	-30. 14'16	-18.283	Lalande 41374.....	21. 12	-34. 12'34	+14.908
Piazzi XIII. 296.....	13. 59	- 4. 22'58	-17.391	Groombridge 3453.....	21. 20	-12. 27'02	+15.409
Piazzi XIV. 30.....	14. 10	+43. 52'26	-16.928	Groombridge 3487.....	21. 28	+44. 42'61	+15.820
κ Boötis.....	14. 10	+43. 59'74	-16.909	Groombridge 3500.....	21. 31	-10. 48'66	+15.975
ι Boötis.....	14. 12	+18. 17'38	-16.679	B. D. + 50° 3401.....	21. 36	-24. 30'94	+16.257
Bradley 1856.....	14. 14	+14. 45'09	-16.720	π^1 Cygni.....	21. 38	-41. 55'45	+16.365
θ Boötis.....	14. 22	+47. 21'20	-16.719	Groombridge 3564.....	21. 42	+22. 31'62	+16.522
β Draconis.....	17. 28	+53. 25'68	- 2.748	Groombridge 3586.....	21. 46	+47. 57'27	+16.736
Lalande 32455-6.....	17. 39	+23. 2'52	- 1.808	β Lacertæ.....	22. 20	+18. 2'45	+17.979
30 Draconis.....	17. 46	-40. 31'16	- 0.942	Piazzi XXII. 103.....	22. 21	-40. 45'05	+18.221
				Groombridge 3780.....	22. 24	-20. 39'53	+18.324
				Piazzi XXII. 137.....	22. 26	+28. 38'91	+18.422
				9 Lacertæ.....	22. 33	-23. 49'40	+18.539

TABLE II.—APPARENT MEAN DAILY ERROR OF OBSERVED ZENITH DISTANCE.

Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.	Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.
1907.					1907.				
January	2	2½	— 2'3	+ '39	July	15	18	+ 15'0	+ '85
	3	1	+ 1'0	+ '08		16	11½	+ 21'9	+ '72
	4	1	0'0	+ '64		17	7	+ 5'7	+ '39
	11	3	+ 2'0	+ '05		18	8	+ 12'7	+ '26
	17	9½	+ 3'2	— '14		19	6	+ 14'8	+ 1'38
	21	1	0'0	— '40		23	13½	+ 15'4	+ 1'17
	28	13	+ 22'5	— '05		24	14	+ 16'6	+ 1'36
	29	1	0'0	+ '14		27	1	+ 1'5	— '04
	30	22½	+ 12'0	+ '16	August	1	17	+ 18'4	+ 1'39
February	1	11	+ 11'2	— '04		7	4	+ 9'4	+ '69
	6	1	+ 1'0	+ '11		10	18	+ 8'3	+ '58
	7	1	0'0	— '43		19	24½	+ 12'4	+ '94
	8	9½	+ 9'1	+ '20		20	6	+ 16'2	+ 1'42
	11	8	— 0'9	+ '07		24	9	+ 3'8	+ '38
	15	2	— 15'5	+ '62		27	12	+ 9'0	+ '54
	19	1	+ 1'0	+ '34		28	21½	+ 8'7	+ '66
	20	9	+ 17'1	+ '03		29	25	+ 9'7	+ '44
	21	3	+ 4'0	+ '03		30	1	+ 1'5	+ '24
	22	17	+ 16'8	— '24	September	2	13½	+ 8'1	+ '31
	27	12	+ 13'8	+ '30		3	3	+ 12'7	+ 1'24
	28	1	+ 1'0	— '81		7	21½	+ 5'6	+ '46
March	1	14	+ 7'3	— '18		9	22½	+ 13'0	+ '82
	4	12	+ 7'2	+ '51		10	18	+ 3'6	+ '17
	5	1	+ 1'0	— '23		11	30½	+ 8'8	+ '89
	6	12	+ 24'4	— '33		12	13	+ 11'7	+ 1'04
	8	4	+ 6'0	+ '24		13	5½	+ 19'1	+ 1'32
	11	15½	+ 13'4	— '20		16	1	+ 1'5	+ '59
	14	1	+ 6'0	+ '19		17	23	+ 13'7	+ '82
	18	20	+ 15'5	+ '07		18	27	+ 8'1	+ '38
	20	15	+ 15'7	— '09		19	29	+ 10'0	+ '52
	21	9½	+ 11'4	+ '16		20	16	+ 13'1	+ '91
	22	13½	+ 17'1	+ '15		23	23	+ 10'2	+ '78
	24	8½	+ 15'0	— '03		24	21½	+ 7'3	+ '57
	25	1½	+ 4'0	+ '17		25	5	+ 4'3	+ '37
	26	10½	+ 13'7	+ '34		26	21	+ 8'0	+ '47
	27	13	+ 15'5	— '12		27	6	— 6'2	— '12
April	1	1	+ 1'0	— '22	October	2	25	+ 8'1	+ '07
	8	3½	+ 31'5	+ '01		4	23	+ 9'7	+ '19
	17	4	+ 29'5	+ '06		7	8½	— 5'1	+ '13
	18	1	+ 1'0	— '28		8	2	+ 2'0	+ '15
	19	14½	+ 20'5	— '27		9	2	+ 0'5	+ '01
	21	7½	+ 18'7	— '08		11	10	+ 0'8	+ '14
	22	12½	+ 22'1	+ '22		12	1	0'0	— '53
	24	9	+ 18'1	— '04		15	4½	— 5'8	+ '02
May	3	6½	+ 17'7	— '19		18	4	+ 1'0	+ '41
	7	12	+ 20'6	+ '49		19	4½	— 6'0	— '14
	10	13	+ 17'2	+ '45		20	1	0'0	+ '36
	17	6	+ 20'6	+ '33		21	5	+ 0'9	— '11
	23	3	+ 4'8	+ '11		22	1	+ 1'0	+ '33
	24	11½	+ 18'2	+ '60		23	9½	+ 1'8	— '11
	28	1	+ 1'5	+ '14		24	2	+ 0'5	— '69
June	10	11	+ 18'7	+ '71		25	3½	— 1'4	— '05
	16	13	+ 16'8	+ '48		30	16½	+ 5'0	+ '14
	17	4	+ 9'4	+ '37		31	2½	+ 2'4	+ '46
	22	11½	+ 13'7	+ '58	November	2	3	— 8'0	+ '18
	24	11½	+ 25'0	+ 1'05		5	1	0'0	— '39
July	2	11	+ 16'9	+ '16		8	7½	— 5'6	+ '53
	4	13½	+ 16'9	+ '82		9	1	+ 1'0	+ '19
	5	1	+ 1'5	+ '23		11	3½	+ 2'6	+ '64
	6	7	+ 0'1	+ '17		13	6½	+ 2'0	+ '10
	10	12½	+ 16'4	+ '75		15	4	+ 3'1	+ '51

TABLE II.—*continued.*

Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.	Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.
1907.					1908.				
Nov. 27	1	+ 1'0	- '15	"	June 12	1	+ 1'5	- '58	"
29	7½	+ 8'0	+ '55	+ '295	14	1	+ 1'5	- '03	
December 3	3½	+ 1'9	- '04	+ '062	19	14	+ 15'0	+ '20	+ '305
6	4	+ 0'7	- '15		23	8½	+ 12'4	+ '36	+ '332
10	4	+ 5'2	+ '15	+ '093	24	6	+ 9'3	- '27	+ '170
11	5½	+ 5'1	+ '33	+ '094	July 1	7	+ 19'7	+ '21	+ '165
13	9½	+ 7'5	+ '32	+ '153	2	13	+ 19'5	+ '41	+ '180
14	1	0'0	+ '22		6	8½	+ 14'3	+ '09	+ '080
16	4½	+ 3'8	+ '35	+ '045	7	1	+ 1'5	+ '06	
17	1½	- 4'0	- '04	- '233	23	18	+ 8'8	+ '02	+ '247
1908.					25	2	+ 2'5	- '22	+ '235
January 1	2	+ 0'5	'00		27	7½	+ 11'5	+ '17	+ '183
2	1	+ 1'5	+ '23		29	2	+ 2'5	- '02	+ '190
3	19½	+ 11'8	+ '35	- '037	31	20½	+ 10'2	+ '12	+ '315
4	2	+ 1'5	+ '14		August 7	2	+ 2'5	- '44	+ '539
10	10	+ 17'7	- '54	- '111	10	7	+ 9'6	- '01	+ '108
12	1	+ 1'5	+ 1'07		11	16½	+ 4'8	- '04	+ '139
13	5½	- 4'2	+ '04	+ '366	13	1	+ 1'5	- '47	
17	11½	+ 16'3	- '12	+ '156	14	17½	+ 15'9	+ '31	+ '278
20	1	0'0	- '81		15	14	+ 2'9	- '22	+ '110
22	3	- 4'5	+ '26	+ '265	19	14½	+ 15'6	+ '08	+ '255
27	17	+ 8'2	+ '16	+ '073	21	1	+ 1'5	+ '03	+ '270
31	9½	+ 13'0	+ '17	'000	22	7	+ 6'4	+ '01	+ '377
February 3	24	+ 14'2	+ '31	+ '113	27	13	+ 0'2	- '08	+ '252
7	7½	+ 13'2	- '01	- '025	28	26½	+ 6'7	+ '15	+ '259
10	9½	+ 17'9	+ '02	+ '142	29	3	- 1'2	+ '25	+ '038
11	1	0'0	- '30		September 1	6½	+ 4'8	+ '18	+ '256
12	21	+ 12'7	+ '06	+ '056	2	3½	- 9'7	- '04	+ '294
14	14½	+ 6'4	+ '03	+ '003	4	6	+ 3'0	+ '07	+ '180
18	7½	+ 11'9	+ '19	- '046	5	10½	+ 13'1	+ '36	+ '200
23	1	+ 1'5	+ '18		7	21½	+ 11'5	+ '02	+ '313
24	7½	+ 16'3	'00	- '085	8	13	+ 1'7	+ '15	+ '290
25	1	+ 1'5	+ '25		10	2	- 12'5	- '68	+ '268
27	6½	+ 5'0	+ '24	- '147	12	2½	- 14'8	- '39	+ '120
28	7	+ 23'9	- '83	- '163	18	6	+ 5'5	+ '10	+ '312
March 9	7	+ 4'9	+ '17	- '140	19	2½	+ 3'9	- '10	+ '170
11	6½	+ 26'2	- '17	- '059	25	9	+ 10'3	+ '23	+ '129
18	6	+ 15'3	+ '02	- '143	28	1	+ 1'5	+ '03	+ '217
19	4	+ 18'0	+ '03	- '205	29	18½	+ 4'1	+ '05	+ '153
23	13½	+ 15'3	- '47	- '128	30	3½	+ 17'1	+ '41	+ '342
April 3	8½	+ 14'6	- '12	- '232	October 1	6½	+ 5'0	- '18	- '142
8	9	+ 16'1	+ '08	- '092	2	5½	+ 6'5	- '07	- '192
13	8	+ 21'9	- '41	- '083	3	2	+ 1'5	- '29	
15	9	+ 20'2	- '38	- '126	5	13½	+ 3'0	- '14	- '084
20	7½	+ 7'0	+ '10	- '300	7	2½	- 14'8	+ '20	- '058
May 1	7	+ 18'2	+ '19	+ '268	8	4½	+ 6'0	+ '26	- '125
6	10	+ 14'6	+ '21	+ '289	12	1½	+ 3'3	+ '27	
10	9	+ 13'2	+ '13	+ '325	14	5½	+ 19'3	+ '15	- '272
13	7½	+ 16'9	+ '29	+ '318	15	1	+ 1'5	+ '25	
18	10	+ 14'4	+ '68	+ '243	21	9½	- 2'2	+ '27	- '208
23	9	+ 27'8	+ '42	+ '260	23	1	+ 2'0	- '03	
27	11½	+ 18'9	+ '15	+ '276	24	6	+ 10'3	- '34	- '194
June 2	1	+ 1'5	+ '45		27	1	+ 2'0	- '88	
3	8½	+ 15'6	+ '20	+ '273	30	8½	+ 8'4	- '10	- '400
4	3	+ 4'8	- '61	+ '127	November 3	1	+ 3'0	'00	
6	1	+ 1'5	+ '05		9	10	- 2'8	+ '18	+ '033
10	1	+ 1'5	- '86		20	1	+ 1'5	+ '66	
11	4	+ 9'4	+ '22	+ '235	23	3	- 4'7	+ '67	- '174
					25	9½	- 5'3	+ '20	- '404
					26	3	+ 0'6	+ '14	- '134
					27	1	+ 2'0	- '10	

RESULTS OF REFLEX ZENITH TUBE OBSERVATIONS,

TABLE II.—*continued.*

Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.	Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.
1908.					1909.				
December 7	2	+ 4'0	+ '41		July 12	10½	+ 16'4	— '40	— '028
9	4½	0'0	+ '40		19	10	+ 17'1	— '33	+ '017
22	1	+ 1'5	+ '82		20	14½	+ 14'0	— '24	— '071
28	2	+ 3'3	+ '79	— '078	24	10	+ 12'4	— '32	— '129
					26	19½	+ 10'6	— '46	— '103
					28	9½	+ 15'0	— '23	— '127
					29	1	+ 1'5	— '88	+ '039
					30	12½	+ 10'7	— '38	— '014
1909.					31	5	+ 17'4	— '53	— '209
January 6	1	+ 1'0	+ 1'10		August 4	23½	+ 11'6	— '47	+ '005
8	10½	+ 19'0	+ '17	— '404	5	19½	+ 11'3	— '32	— '107
11	9	+ 3'1	+ '33	— '164	6	17½	+ 14'6	— '73	— '020
13	15½	+ 15'0	+ '27	— '116	11	22	+ 10'0	— '47	— '069
15	1	+ 2'0	+ 1'35		19	13½	+ 11'1	— '41	— '078
16	1	0'0	+ '71		27	8	+ 9'3	— '21	— '175
19	2	+ 1'0	+ '42		28	24½	+ 8'5	— '35	— '096
20	1	0'0	+ 1'08		31	15½	+ 8'8	— '61	— '042
25	7½	+ 5'9	+ '31	— '287	September 1	9	+ 1'8	— '24	+ '026
February 5	1	0'0	+ 1'06		2	11	+ 23'5	— '60	— '010
6	1	0'0	+ '14		3	4	+ 20'6	+ '12	+ '210
8	5	+ 13'6	— '09	— '477	6	20½	+ 6'2	— '18	— '008
12	7½	+ 14'4	+ '16	— '384	7	1½	— 3'2	— 1'20	— '096
15	7½	+ 18'0	— '36	— '337	8	13½	+ 11'7	— '49	— '075
17	1	0'0	+ '77		9	14½	+ 6'4	— '34	— '057
19	12½	+ 21'9	— '35	— '134	11	15	+ 12'1	— '38	— '138
20	3½	+ 18'6	+ '05	— '171	14	6	+ 3'8	+ '14	— '043
22	14	+ 12'9	+ '60	— '490	18	16½	+ 4'9	— '03	— '069
March 8	6½	+ 14'0	+ '03	— '731	20	7½	+ 22'5	— '43	— '017
17	5	+ 11'2	0'0	— '371	22	1	+ 1'5	— '23	
April 5	11½	+ 12'8	— '40	— '300	23	6½	+ 2'5	— '28	+ '053
7	11½	+ 17'5	— '59	— '424	24	7½	+ 13'1	— '01	— '186
9	3	— 5'3	+ 1'39	— '292	27	5	— 4'4	+ '01	— '121
10	7½	+ 12'1	— '31	— '326	30	1½	— 3'2	— '02	+ '046
14	11	+ 20'0	— '96	— '413	October 6	17½	+ 5'3	— '43	— '321
15	10	+ 21'6	— 1'03	— '330	8	19	+ 1'0	— '30	— '395
20	5	+ 16'0	— '99	— '444	12	3½	+ 7'4	— 1'04	— '240
25	2	+ 2'5	0'0		13	10½	— 0'3	— '68	— '588
27	9½	+ 16'1	— '81	— '476	14	1	+ 1'0	— '07	
May 2	10	+ 19'7	— '02	+ '025	18	1	+ 2'0	+ '07	
3	3	+ 20'3	— '31	— '196	19	2½	+ 2'8	— '26	— '155
4	7	+ 16'2	— '40	+ '016	21	2	+ 1'0	— '41	— '168
5	11	+ 19'0	— '38	— '085	25	6	+ 10'3	— '72	— '331
6	12½	+ 15'2	— '31	— '035	29	7	— 8'3	+ '88	— '440
7	1	+ 16'6	+ '01	+ '008	November 5	21	+ 2'8	— '13	— '405
8	1	+ 1'5	+ '92	+ '045	6	1	+ 1'0	+ '39	
10	11½	+ 16'1	— '43	— '102	8	11	+ 2'4	— '34	— '387
11	9½	+ 13'5	— '19	— '192	9	1	+ 1'0	— '01	
17	7½	+ 12'6	— '47	+ '038	10	12	— 1'5	+ '36	— '266
18	5½	+ 18'0	— '49	— '132	15	5½	— 3'4	+ '43	
19	13	+ 11'9	— '46	— '108	17	1	+ 1'0	— '20	
20	11½	+ 11'0	— '02	— '125	18	1	+ 2'0	— '39	
21	13½	+ 11'1	— '28	— '040	19	2	+ 1'5	+ '28	— '273
23	12½	+ 11'6	— '08	— '083	22	8	— 5'5	+ '23	
24	4	+ 9'4	— '49	— '099	27	1	+ 1'5	— '15	
29	12	+ 14'3	— '08	— '055	28	1	0'0	+ '31	
June 7	10½	+ 25'3	0'0	— '003	30	1	+ 1'0	— '24	
10	13	+ 14'8	— '39	— '016	December 3	12	+ 8'8	+ '16	— '357
17	3	+ 13'8	— '17	+ '034	8	6	+ 0'8	— '08	
22	14½	+ 14'0	+ '06	— '037	20	1	0'0	— 1'42	
30	8	+ 16'0	— '05	— '082	29	2	— 16'0	+ 1'67	— '530
July 1	7½	+ 7'9	— '40	— '064	31	8	+ 25'2	— 1'22	— '450
8	13½	+ 13'5	+ '13	+ '040					

TABLE II.—*continued.*

Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.	Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.
1910.					1910.				
January 10	11	+ 1'9	+ '35	— '350	August 6	18½	+ 10'5	— '67	— '399
11	1	+ 1'2	— '09		10	18½	+ 14'6	— '94	— '456
12	14½	+ 12'7	+ '04	— '355	12	10	+ 7'9	— '47	— '506
16	2	+ 1'3	+ '44		15	2	+ 1'2	— '08	
19	12½	+ 20'1	— '98	— '266	16	3	+ 10'7	— '90	— '529
21	6	+ 0'2	+ '57		17	13½	+ 8'2	— '70	— '420
26	22	+ 11'4	— '20	— '399	19	4	+ 12'0	— '77	— '447
February 2	4	— 2'0	— '12	— '323	20	20½	+ 9'9	— '60	— '472
4	11½	+ 17'4	— 1'05	— '380	24	12	+ 21'0	— 1'15	— '457
7	7	+ 18'4	— '42	— '417	25	1	+ 1'3	— '66	
9	17	+ 15'7	— '76	— '410	26	15	+ 17'5	— 1'25	— '427
11	20½	+ 14'3	— '36	— '359	27	6½	— 1'2	— '58	— '399
18	16½	+ 15'0	— '19	— '254	29	5	+ 1'3	— '39	
20	1	+ 1'3	— '00		30	9	— 0'4	— '45	— '448
21	4	+ 13'5	— '22	— '357	September 1	13	+ 4'7	— '65	— '379
23	8½	+ 7'6	— '15	— '216	3	28	+ 7'6	— '55	— '410
25	3½	+ 23'1	— '60	— '456	9	18	+ 6'4	— '82	— '400
28	9½	+ 21'7	— '66	— '181	12	16½	+ 11'1	— 1'00	— '488
March 2	7	+ 11'7	+ '06	— '386	20	18	+ 3'4	— '19	— '382
3	2	+ 1'2	— '40		22	4	— 11'8	+ '49	— '530
4	22½	+ 12'9	— '04	— '425	26	7½	+ 25'2	— 1'09	— '313
7	11½	+ 4'2	— '04	— '349	27	20	+ 3'1	— '73	— '476
14	9½	+ 14'5	— '16	— '368	30	7	— 5'3	— '37	— '632
15	5½	+ 23'1	— '36	— '259	October 3	7½	+ 6'9	— '45	— '475
22	8½	+ 19'4	— '34	— '024	10	12½	+ 0'2	— '79	— '428
29	4½	+ 15'4	+ '11	— '363	14	3	— 1'7	— '51	— '337
April 1	10½	+ 14'7	— '29	— '313	17	1½	— 2'0	— '47	— '165
22	3	+ 4'3	+ '73	— '090	24	1½	— 14'6	— '52	— '307
24	4	+ 9'3	— '41	— '347	28	9½	— 5'7	— '33	— '419
26	12	+ 20'8	— '68	— '505	November 2	10½	— 8'4	— '51	— '493
28	7	+ 23'3	— '92	— '548	4	5½	+ 0'4	— '38	— '816
29	6½	+ 24'8	— '82	— '577	7	6½	— 2'6	— '10	— '465
May 2	8½	+ 17'9	+ '03	— '345	8	3	— 1'7	+ '12	— '458
4	3	+ 19'3	— '59	— '423	9	13½	— 7'3	+ '29	— '549
6	10	+ 17'5	— '45	— '373	11	6	— 15'3	+ '57	— '335
8	2	+ 1'3	+ '40		14	12	+ 1'5	— '65	— '494
9	12	+ 16'3	— '28	— '471	16	13	— 6'7	— '68	— '456
10	11	+ 18'1	— '31	— '391	21	3	— 1'0	— 1'09	— '586
12	10	+ 19'2	— '61	— '449	22	1	+ 0'2	— 1'07	
22	10½	+ 19'7	— '61	— '378	25	2	— 3'0	— '61	— '390
23	12	+ 16'8	— '52	— '408	26	4	— 1'8	— 1'12	— '428
31	10	+ 14'5	— '57	— '449	28	7	— 3'1	— '23	— '705
June 1	5	+ 11'2	— '15	— '445	December 5	4	— 2'0	— '32	— '188
3	7½	+ 21'1	— 1'61	— '375	12	3½	+ 0'6	— '31	— '326
8	2	— 19'5	+ '99	— '785	19	10½	+ 11'0	— '64	— '447
13	10	+ 17'3	— '58	— '405	21	2½	— 3'2	— '26	— '637
14	13	+ 15'9	— '53	— '399	1911.				
15	14½	+ 15'9	— '47	— '406	January 6	8½	+ 6'0	— '01	— '310
16	14	+ 16'4	— '76	— '427	9	15½	+ 9'1	— '44	— '408
20	14	+ 17'0	— '80	— '502	13	5	+ 0'2	+ '29	
22	12½	+ 14'2	— '62	— '521	23	5	+ 11'4	— '59	— '419
28	5	+ 11'2	— '28	— '410	25	5½	+ 10'7	— '08	— '472
July 1	3½	+ 28'3	— 1'52	— '498	30	6	+ 11'2	— '35	— '699
4	4	+ 4'3	— '75	— '395	February 1	10	+ 5'7	— '30	— '432
6	7½	+ 13'5	— '44	— '445	13	15½	+ 15'4	— '84	— '461
11	8	+ 11'1	— '28	— '504	20	8½	+ 16'9	— '45	— '547
19	4½	+ 11'3	— '69	— '485	24	1	+ 0'2	— '04	
22	14	+ 16'1	— '71	— '439	25	7½	+ 15'2	— '39	— '397
23	13	+ 16'8	— '82	— '473					
25	14½	+ 15'9	— 1'09	— '447					
26	6½	+ 19'7	— 1'23	— '363					

TABLE II.—*continued.*

Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.	Date.	Number of Observations.	Approximate Mean Zenith Distance North.	Mean of Apparent Errors.	Adopted Correction for Scale per 10' Zenith Distance.
1911.					1911.				
March					June				
1	5½	— 5'1	— '21	— '550	28	1	+ 1'3	— '13	
7	8½	+ 14'2	— '43	— '366	4	5½	— 1'8	— '03	— '429
9	1	+ 1'3	— 1'82		5	14	+ 16'5	— '82	— '515
20	7½	+ 16'4	— '27	— '409	7	12½	+ 14'2	— '78	— '486
24	6	+ 16'8	— '67	— '380	8	12½	+ 10'4	— '61	— '448
27	4	+ 9'0	— '33	— '320	12	13½	+ 13'6	— '58	— '444
28	1½	— 32'7	+ 1'88	— '673	13	12	+ 14'3	— '59	— '333
April					14	10½	+ 21'7	— '51	— '462
7	6	+ 20'8	— '62	— '241	15	13	+ 14'8	— '53	— '327
19	3	— 5'3	+ '22	— '570	17	4½	+ 6'9	— '01	— '435
24	8	+ 21'8	— '57	— '273	18	11½	+ 12'4	— '35	— '399
May					19	8	+ 11'5	— '71	— '379
2	3	+ 12'0	— '59	— '539	20	11	+ 2'6	— '37	— '430
4	10	+ 13'8	— '50	— '423	21	14½	+ 15'9	— '91	— '501
8	9	+ 9'0	— '38	— '517	22	9½	+ 5'4	— '10	— '576
11	7	+ 12'7	— '39	— '507	25	5	+ 11'0	— '58	— '479
22	14	+ 15'1	— '66	— '559	26	10	+ 17'7	— 1'04	— '557
23	3	+ 19'0	— 1'01	— '528	27	12	+ 14'3	— '85	— '547
24	11½	+ 14'9	— '81	— '543	August	1	+ 12'1	— '97	— '640
26	3	+ 4'3	— '19	— '414	3	12	+ 10'5	— '73	— '490
29	1½	+ 14'6	— '49	— '396	9	20	+ 14'7	— '92	— '497
June					11	12	+ 16'0	— '90	— '526
1	11½	+ 19'1	— '64	— '456	14	16	+ 15'9	— 1'42	— '460
7	12½	+ 15'3	— '47	— '533	15	14	+ 6'3	— '61	— '454
8	14½	+ 15'9	— 1'07	— '483	16	16½	+ 8'1	— '53	— '512
9	12	+ 11'7	— '26	— '529	17	25	+ 7'4	— '58	— '482
10	13	+ 16'3	— '57	— '513	18	8	+ 16'3	— '98	— '600
14	2	— 20'0	+ '61	— '602	23	7	+ 9'1	— '68	— '504
20	4	+ 9'3	— '53	— '557	24	14½	+ 6'8	— '79	— '477
21	5½	+ 21'1	— '66	— '503					
24	8	+ 10'0	— '38	— '484					
27	7	+ 8'0	— '43	— '520					

TABLE III.

Mean Date of Group.	Residual corrected for Scale Constant.	Albrecht's Latitude Variation corres- ponding.	Gr.—Albr.	Mean Correction for Scale (per 10' Z.D.).	Limiting Dates of Group.
1907.					
January 30	+ "059	— "05	+ "11	— "027	January 1–February 11
March 1	+ "088	— "03	+ "12	— "093	February 15–March 11
March 25	+ "129	— "02	+ "15	— "038	March 14–March 27
May 1	— "147	+ "01	— "16	+ "020	April 1–May 24
June 25	+ "032	+ "04	— "01	+ "028	May 28–July 15
July 25	+ "066	+ "06	+ "01	+ "318	July 16–August 10
August 25	+ "074	+ "07	"00	+ "235	August 19–September 2
September 10	+ "241	+ "09	+ "15	+ "185	September 3–September 13
September 20	+ "141	+ "09	+ "05	+ "131	September 16–September 23
October 1	+ "133	+ "10	+ "03	+ "077	September 24–October 4
October 20	+ "048	+ "11	— "06	+ "140	October 7–October 30
December 1	+ "242	+ "10	+ "14	+ "057	October 31–December 17
1908.					
January 15	+ "091	+ "04	+ "05	+ "074	January 1–February 3
February 15	+ "040	— "05	+ "09	— "080	February 7–March 11
April 10	— "045	— "17	+ "12	— "128	March 18–May 10
June 5	— "172	— "20	+ "03	— "075	May 13–June 23
July 20	— "157	— "13	— "03	— "145	June 24–August 10
August 20	— "146	— "04	— "11	— "113	August 11–August 28
September 5	— "037	"00	— "04	— "119	August 29–September 19
October 5	+ "033	+ "08	— "05	— "154	September 25–October 15
November 20	+ "206	+ "18	+ "03	— "218	October 21–December 28
1909.					
January 30	+ "568	+ "20	+ "37	— "270	January 6–February 22
April 10	+ "092	+ "02	+ "07	— "381	March 8–May 3
May 10	— "165	— "10	— "06	— "427	May 4–May 20
June 10	— "114	— "19	+ "08	— "400	May 21–July 1
July 20	— "208	— "29	+ "08	— "404	July 8–July 30
August 10	— "378	— "32	— "06	— "421	July 31–August 27
September 1	— "361	— "32	— "04	— "385	August 28–September 8
September 20	— "114	— "28	+ "17	— "433	September 9–September 30
October 15	— "227	— "18	— "05	— "380	October 6–November 5
November 20	+ "148	— "02	+ "17	— "357	November 6–December 31
1910.					
January 24	+ "158	+ "19	— "03	— "369	January 10–February 9
February 25	+ "215	+ "24	— "02	— "341	February 11–March 7
April 19	+ "364	+ "20	+ "16	— "375	March 14–May 10
June 3	+ "072	+ "04	+ "03	— "422	May 12–June 16
July 7	— "038	— "14	+ "10	— "469	June 20–July 26
August 16	— "218	— "31	+ "09	— "453	August 6–August 25
September 2	— "436	— "33	— "11	— "429	August 26–September 12
October 11	— "500	— "32	— "18	— "456	September 20–November 4
November 24	— "473	— "22	— "25	— "471	November 7–December 21
1911.					
February 7	+ "060	+ "04	+ "02	— "460	January 6–March 9
April 26	+ "078	+ "15	— "07	— "464	March 20–May 26
June 14	+ "125	+ "13	"00	— "495	May 29–June 28
July 11	+ "018	+ "06	— "04	— "426	July 4–July 18
July 27	— "140	"00	— "14	— "517	July 19–August 9
August 17	— "270	— "08	— "19	— "496	August 11–August 24