

KG

11366

v. 899

Volume XXIII
Harvard Lunar
Plates.

No.

1380

1381

1397

1911phae.proj.1

PRINCETON UNIVERSITY OBSERVATORY
PRINCETON, N. J.

U.S.A.

Haward Lunar Plates
Measures and Reductions

Mary Fowler

Volume XXII

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2

11C 1380 Stars measures.

1913 May 29. 1

	a	v	a	v
1	16628	18830	17070	17090
10.4	805045	1741005	1072019	134200
19.8	49	10	1220	190
	30	20	70	80
	<u>19.8582</u>	<u>8579</u>	<u>103648</u>	<u>3670</u>
2	15336	15719	15533	16109
16.5	983831	1122020	11623	99755
17.8	30	20	1819	6871
	30	09	30	82
	<u>11.5498</u>	<u>5506</u>	<u>166088</u>	<u>6118</u>
3	14350	15180	14051	14785
25.5	642428	1309799	890094	990015
27.7	1525	9299	9890	0806
	37	80	29	80
	<u>27.7917</u>	<u>7916</u>	<u>25.4856</u>	<u>4876</u>

M1380 Stars measures

1913 May 29. 1

	a	v	a	x	v
1	16628	18830	17070	17090	
10.4	8050 45	17410 05	10720 19	13420	
19.8	49	10	1220	1910	
	30	20	70	80	
	<u>19.8582</u>	<u>8579</u>	<u>10.3648</u>	<u>3670</u>	
2	15336	15719	15533	16109	
16.5	9838 31	11220 20	11623	9975	
17.8	30	20	1819	6871	
	30	09	30	82	
	<u>11.5498</u>	<u>5506</u>	<u>166088</u>	<u>6118</u>	
3	14350	15180	14051	14785	
25.5	6424 28	13097 99	8900 94	9900 10	
27.7	15 25	97	9890	0806	
	37	80	29	80	
	<u>27.7917</u>	<u>7916</u>	<u>254856</u>	<u>4876</u>	

MC1380 H₂gon - means

1913 May 29.

2

	α	δ	α	δ	N
1	19330	18760			
19.5	1672532	1137060			
19.4	31	75			
min	28	53			
in					
4	<u>19.2600</u>	<u>.2613</u>			

2	18392	17710			
19.0	1508992	1098895			
19.4	91	91			
	85	10			
	<u>19.3300</u>	<u>.3281</u>			

3	1228081	12990			
18.0	75	1237064			
19.9		3050			
	11642				
	<u>19.9363</u>	<u>.9364</u>			

4	17340	16908			
17.5	1227550	1194039			
21.0	6065	41			
	20	98			
	<u>17.4935</u>	<u>.4963</u>			

5	16287	15930			
17.4	1095055	1123843			
21.3	3649	30			
min	72	26			
in					
20	<u>17.4665</u>	<u>.4691</u>			

6	15180	15000			
17.6	1100010	916953			
22.0	10	55			
	69	88			
	<u>17.5831</u>	<u>.5834</u>			

MC1380 Hydrogen - measures.

1913 May 29.

2

	a	N
✓ 1	19330	18760
19.5	1672532	1137060
19.4	31	75
mm	28	53
$\frac{1}{4}$	<u>192600</u>	<u>2613</u>

3	18392	17710
190	1508992	1098895
199	91	91
	85	10
	<u>193300</u>	<u>3281</u>

3	1228081	12990
180	75	1237069
199		3050
	11642	
	<u>199363</u>	<u>9364</u>

4	17340	16908
17.5	1227558	1194039
210	6065	41
	20	98
	<u>174935</u>	<u>4963</u>

5	16287	15930
17.4	1095055	1123843
21.3	3649	30
mm	72	26
$\frac{1}{2}$	<u>174665</u>	<u>4691</u>

6	15180	15000
17.6	1100010	916953
22.0	10	55
	69	88
	<u>175831</u>	<u>5834</u>

MC1380.

Moon Measures

1913 May 29 (3)

Z d y w a x

18.0 14897

14917

226 7935

1186457

3130

5457

84

69

22.6956.6944~~8~~

18631

15011

184

1205079

1154035

23.0

6861

6040

25

90

18.3436.3460

MC1380.

Moon Measures

1913 May 29 (3)

Z d 4

$$\begin{array}{r} 180 \\ 226 \\ \hline 14897 \\ 7935 \\ 31 \\ \hline 226956 \end{array}$$

$$\begin{array}{r} 14917 \\ 1186457 \\ 54 \\ \hline 6944 \end{array}$$

$$\begin{array}{r} 184 \\ 230 \end{array}$$

$$\begin{array}{r} 18631 \\ 1205074 \\ 6861 \\ 25 \\ \hline 18.3.436 \end{array}$$

$$\begin{array}{r} 15011 \\ 1154035 \\ 6040 \\ 90 \\ \hline 3460 \end{array}$$

1913 June 2.

4

MC1380

Times etc.

Exp to stars 1911 Nov 3 $22^h 24^m$ - $22^h 36^m$
 " Moon $22 \ 30 \ 09.7$ - $22 \ 30 \ 09.9$
 Clock slow $0 \ 43.2$

H Sid T. $22 \ 30 \ 53.0$
 H Long $4 \ 44 \ 31.05$
 G Sid T. $27 \ 15 \ 24.05$
 Sid T. Moon $14 \ 46 \ 30.61$
 Interval $12 \ 28 \ 53.44$
 Reduction $2 \ 02.69$
 G. M. T. $12 \ 26 \ 50.75$

Iron Naut alus

R.A.

Decl.

Moon $12^h 24^m 33.12$ + $0^\circ 11' 57.5$
 Motion $1^m \ 2.0004$ 16.022
 " 26.8458 + 53.70 + $7 \ 10.1$
 Tabular place $0^h 25^m 26.82$ + $0^\circ 19' 07.6$

Moon's age 13 days
 Moon's parallax $57' 59.0$
 " Semidiam $15 \ 49.6$

1913 June 20

4

M101380

Times etc

Exp to stars 1911 Nov 3 $22^h 24^m$ - $22^h 36^m$
 " Moon $22 30$ $097-22 30$ 09.6
 Clock slow 0 43.2

H Sid T

 $22 30 53.0$

H long

 $4 44 31.05$

G Sid T

 $27 15 24.05$

Sid T. Moon

 $14 46 30.61$

Interval

 $12 28 53.44$

Reduction

 $2 02.69$

G On T

 $12 26 50.75$

Iron Nant Alu

R. A

Decl

Moon $12^h 24^m 33.12$ $+0^\circ 11' 57.5$ Moon $1^m 2.0004$ 16.622 26.8958 53.70 $+7 10.7$ Tabular place $0 05 26.82$ $+0^\circ 19' 07.6$

Moon's parallax

 $57' 59.0$

Lunar diam

 $15 49.6$

MC138-D				Standard Coords - Stars				1913 June 2.				5
Cape no. 49 mag 6.4				Cape no. 57 mag 7.8				Cape no. 67 mag 8.7				
C	0	21	29.66	0	24	47.38		0	29	16.41		
L			68			42				42		
E			63			44				39		
mean	0	21	29.66	0	24	47.41		0	29	16.41		
Prec			+33.84			+33.86				+33.81		
g	0	22	03.50	0	25	21.27		0	29	50.22		
A	0	26	01	0	26	01		0	26	01		
A-A	-	3	57.50	-	00	39.73		+	3	49.22		
sin(A-A)			-237.49			-39.73				+229.21		
log ..			2.37564m			1.59912m				2.36023		
.. cos			9.99998			9.99998				9.99998		
.. S.			0.88286m			0.10619m				0.86745		
S.			-7.6358			-1.2770				+73697		
S ₁			-13			1				+31		
S			10.3629			16.7229				25.3728		
α			10.3659			16.6103				25.4866		
α-β			+30			-1126				+1138		
C	-0	36	12.3	-1	40	00.70		+0	27	04.0		
L			12.7			06.3				04.5		
E			12.5			07.3				03.6		
mean	-0	36	12.5	-1	40	06.9		+0	27	04.0		
Prec			+339.6			+338.5				+338.7		
g	-0	32	32.9	-1	36	28.4		+0	30	42.7		
A	-0	15	10	-0	15	10		-0	15	10		
g-A	-	17	22.9	-1	-21	18.4		+0	45	52.7		
sin(g-A)			-104.29			-48.793				+2752.9		
log ..			3.01824m			3.68836m				3.43979		
.. cos			0.34939m			1.01951m				0.77094		
.. tan			7.9763m			8.4483m				7.9511		
.. S ₂			1.7637			0.2124				1.7349		
.. S ₁			6.7934m			5.7141m				6.7394		
.. S ₂			+22356			-10.4595				+5.9011		
.. S ₁			-6			1				+5.5		
.. S ₂			19.7638			11.5404				27.9016		
.. S ₁			19.8580			11.5502				27.7916		
.. S ₂			+942			+98				-1100		

MC1380				Standard Coordinates - Stars				1913 June 2				5
Cape no. 49 mag 6.4				Cape no. 57 mag 7.8				Cape no. 67 mag 8				
C	0°	21'	29.66	0°	24'	47.38		0°	29'	16.41		
L			68			42				42		
E			63			44				39		
mean	0	21	29.66	0	24	47.41		0	29	16.41		
Pruc			+33.84			+33.86				+33.81		
q	0	22	03.50	0	25	21.27		0	29	50.22		
A	0	26	01	0	26	01		0	26	01		
A-A	-	3	57.50	-	00	39.73		+	3	49.22		
sin(A-A)			-237.49			-39.73				+239.21		
log ..			2.37564~			1.59912~				2.36023		
.. cos			999998			999983				999998		
.. S.			0.88286~			0.10619~				0.86745		
S.			-76358			-12770				+73697		
S.			-13			1				+31		
S			103629			167229				253728		
Σ			103659			166103				254866		
Σ-S			+30			-1126				+1138		
C	-0°	36'	12.3	-1°	40'	00.70		+0°	27'	04.0		
L			12.7			06.3				04.5		
E			12.5			07.3				03.6		
mean	-0	36	12.5	-1	40	06.9		+0	27	04.0		
Pruc			+3.39.6			+3.58.5				+3.38.7		
q	-0	32	32.9	-1	36	28.4		+0	30	42.7		
q	-0	15	10	-0	15	10		-0	15	10		
8-0	-12	22.9		-1-21	10.4			+0	4.5	52.7		
tan(8-0)			+1042.9			-487.93				+2752.9		
log ..			3.01824~			3.68836~				3.43979		
.. cos			0.34939~			1.01951~				0.77094		
.. tan			7.9763~			8.4483~				7.9511		
S.			17637			02124				17349		
Σ			67934~			57141~				67394		
Σ			+22356			-+04595				+59018		
Σ			-6			1				+58		
Σ			19.7638			11.5404				27.9016		
Σ			19.8580			11.5502				27.7916		
Σ			+942			+98				-1100		

14

1

2

3

1913 June 2

6

MC1380

Center of Plate

R. A

Decl.

γ	γ							
10.36 59	198580	0	22	03.5	-0	32	33	
16.61 03	115502	0	25	21.3	-1	36	28	
25.48 66	2779.16	0	29	50.2	+0	30	43	
3152.4628	591998		77	15.0	-1	38	18	
17.4476	197333	0	25	45	-0	32	46	
-18	-22			+16		+17	36	
0.51	237	0	26	01	-0	55	10	
31	465							
51	1135							
153	1362							
15.81	908							
	1055.55							
	1020							

$$A = 0^h 26^m 01^s$$

$$D = -0^\circ 55' 10''$$

Plate Const.

Preliminary Reduction

$$\begin{aligned}
 x-3 &= 1404 & +0.74 & -0.27 & +2739 \\
 +20 &= 2781 & -2751 & +14 &= -2737 & -2 &= -2739 &= 0 \\
 -1126 &= 1617 &= -2743 & +8 &= -2735 & -3 &= -2738 &= +1 \\
 +1138 &= 3891 &= -2753 & +19 &= -2734 & -5 &= -2739 &= 0 \\
 19.5247 &= 2984 & +15 & -4 &= 19.5013
 \end{aligned}$$

$$\begin{aligned}
 y-4 &= 1352 & -0.24 & +0.22 & -2340 \\
 +942 &= 1400 &= +2342 & -4 & +2 &= +2340 &= 0 \\
 +98 &= 2242 &= +2340 & -2 & +3 &= +2341 &= +1 \\
 -1100 &= 3441 &= +2341 & -6 & +5 &= +2340 &= 0 \\
 21.3169 &= 2636 & -4 & +4 &= 21.3465
 \end{aligned}$$

$$\begin{aligned}
 \text{Tabular } b+d &= +3.4 & a &= -0.5 & e &= -2.7 \\
 \text{Observed} &+4.1 & &+0.2 & &+0.2
 \end{aligned}$$

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1911phae.proj.1

1913 June 2

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NIC 1380

Center of Plate

R. A.

Decl.

76	4								
10.36 59	19 45 80	0	22	03.5	-0	32	33		
16.61 03	11 55 02	0	25	21.3	-1	36	28		
25.48 66	27 79 16	0	29	50.2	+0	30	43		
21.52 46 28	59 19 98		77	15.0	-1	28	14		
17.45 76	19 73 72	0	25	45	-0	32	46		
-18	-22			+16		-17	36		
0.51	227	0	26	01	-0	15	10		
31	403								
51	1135								
153	1362								
15.51	1908								
	105555								

$$A = 0^h 26^m 01^s$$

$$D = -0^\circ 45' 10''$$

Plate 200

Preliminary Reduction

2-3	-1404	-	+0.74	-0.27	+2739
+20	-2781	= -2751	+14	= -2737	-2739 = 0
-1126	-1617	= -2743	+8	= -2735	-3 = -2737 + 2
+1138	-3891	= -2753	+19	= -2734	-5 = -2739 + 5
19.5247	-2984		+15	-4	= 19.5013

4-7	+1352	-0.24	+0.22	-2340
+942	+1400	= +2342	-4	+2 = +2340 = 0
+98	+2242	= +2340	-2	+3 = +2341 = +1
-1100	+3441	= +2341	-6	+5 = +2340 = 0
21.3169	+2636		-4	+4 = 21.3465

Tabular	b+d	= +3.4	a	= -0.5	a	= -2.7
Observed		+4.1		+0.2		+0.2

Formation of Normals.

	at	an	bn
1	- 0.00 +	00 -	39 0
2	+ 1.04 +	94 +	35.7
3	+ 2.10 +	28.8 +	26.2
4	+ 0.64 +	223.4 +	34.7
5	- 0.00 -	4.1 +	00
6	- 1.33 -	163.0 +	57.4
7	- 2.10 -	76 -	6.9
8	- 1.98 -	44.8 +	64.0
	- 1.63 +	42.1 +	185.9

$$[ac] = - 10.97$$

$$[ac] = + 18.40$$

$$[bc] = - 1.99$$

$$[bc] = + 15.39$$

pt.	pos. L.	resid.
1	180.0	+ 1.1
2	194.7	- 8
3	228.0	+ 1.3
4	261.2	- 8.4
5	270.0	+ 2.2
6	289.4	+ 8.4
7	312.0	- 2.7
8	325.2	- 1.3

MC 1380

1913 June 12.

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Moon's Center

	x	$x - X_0$	Δx	$(x - X_0)^2$	R^2	$O - C$
1	19.5229	0.0000 + 6		0.0000	4.2251	+ 19
2	19.0000	-0.5229 + 6		0.2728	4.2214	- 18
3	18.0000	-1.5229 + 4		2.3180	4.2213	- 19
4	17.4949	-2.0280 + 1		4.1124	4.2122	- 110
5	17.4678	-2.0551	0	4.2234	4.2234	+ 2
6	17.5832	-1.9397 - 2		3.7632	4.2316	+ 84
7	18.0000	-1.5229 - 4		2.3204	4.2237	+ 5
8	18.3448	-1.1781 - 5		1.3891	4.2270	+ 38

mean = 4.2232 + 1

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
-1	19.2606	-2.0551 - 4		4.2251
2	19.3290	-1.9867 - 4		3.9486
3	19.9364	-1.3793 - 3		1.9033
4	21.0000	0.3157 - 1		0.0998
5	21.3157	0.0000	0	0.0000
6	22.0000	+0.6843 + 1		0.4684
7	22.6950	+1.3793 + 3		1.9033
8	23.0000	+1.6843 + 3		2.8379

Approximate Center

$$x = 18.0 \quad y = 19.9364$$

$$22.6950$$

$$4.26314$$

$$\text{mean } y = 21.3157$$

$$y - \text{min} = 19.2606$$

$$R = 2.0551$$

$$x - \text{min} = 17.4678$$

$$\text{mean } x = 19.5229$$

$$\left. \begin{array}{l} \text{Assumed} \\ \text{Center} \end{array} \right\} \begin{array}{l} X_0 = 19.5229 \\ Y_0 = 21.3157 \end{array}$$

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1913 June 12.

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Moon's Center

	x	$x - X_0$	Δx	$(x - X_0)^2$	R^2	$0 - C$
1	19.5229	0.0000 + 6	0.0000	4.2251	+19	
2	19.0000	-0.5229 + 6	0.2728	4.2214	-18	
3	18.0000	-1.5229 + 4	2.3180	4.2213	-19	
4	17.4949	-2.0280 + 1	4.1124	4.2122	-110	
-5	17.4678	-2.0551	0	4.2234	+2	
6	17.5832	-1.9397 - 2	3.7632	4.2316	+84	
7	18.0000	-1.5229 - 4	2.3204	4.2237	+5	
8	18.3448	-1.1781 - 5	1.3891	4.2270	+38	

mean = 4.2232 +1

	y	$y - Y_0$	Δy	$(y - Y_0)^2$
-1	19.2606	-2.0551	-4	4.2251
2	19.3290	-1.9867	-4	3.9486
3	19.9364	-1.3793	-3	1.9033
4	21.0000	-0.3157	-1	0.0998
5	21.3157	0.0000	0	0.0000
6	22.0000	+0.6843	+1	0.4684
7	22.6950	+1.3793	+3	1.9033
8	23.0000	+1.6843	+3	2.8379

Approximate Center

$$x = 18.04 = 19.9364$$

$$22.6950$$

$$4.26314$$

$$\text{mean } y = 21.3157$$

$$y - \text{min} = 19.2606$$

$$R = 2.0551$$

$$x - \text{min} = 17.4678$$

$$\text{mean } x = 19.5229$$

$$\left. \begin{array}{l} \text{Assumed} \\ \text{Center} \end{array} \right\} \begin{array}{l} X_0 = 19.5229 \\ Y_0 = 21.3157 \end{array}$$

MC1880

Moon's Center

1913 June 12.

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Conditional Equations

		c	o-c
1	$0.00 - 2.06 + 1 = +19$	$0 - 47 + 55 = +8$	$+11$
2	$-0.52 - 1.99 + 1 = -18$	$-19 - 46 + 55 = -10$	-8
3	$-1.52 - 1.38 + 1 = -19$	$-55 - 32 + 55 = -32$	$+13$
4	$-2.03 - 0.32 + 1 = -110$	$-74 - 7 + 55 = -26$	-84
5	$-2.06 + 0.00 + 1 = +2$	$-75 + 0 + 55 = -20$	$+22$
6	$-1.94 + 0.68 + 1 = +84$	$-71 + 16 + 55 = +0$	$+84$
7	$-1.52 + 1.38 + 1 = +5$	$-55 + 32 + 55 = +32$	-27
8	$-1.18 + 1.68 + 1 = +38$	$-43 + 39 + 55 = +51$	-13
			$+130 - 132$

Average = 33

Normal Equations

$$+18.40 - 1.63 - 10.77 = +42$$

$$-1.63 + 15.39 - 1.99 = +186$$

$$-10.77 - 1.99 + 800 = +1$$

$$\frac{\Delta x}{\Delta n} = +1.23$$

$$+1.63 - 0.14 - 0.955 = +4$$

$$+10.77 - 0.955 - 6.245 = +24\frac{1}{2}$$

$$+15.25 - 2.945 = +190$$

$$-2.945 + 1.705 = +25\frac{1}{2}$$

$$\frac{\Delta y}{\Delta n} = +0.40$$

$$+2.945 - 0.57 = +36\frac{1}{2}$$

$$+1.135 = +62$$

$$c = +55$$

$$-5.09 + 2.945 = +44$$

$$+10.16 = +234$$

$$b = +23 +$$

$$+8.81 + 1.63 - 6.55 = -1$$

$$-83.10 - 15.39 + 61.80 = +8$$

$$+27.21 - 17.32 = +41$$

$$-84.73 + 59.81 = +194$$

$$-245.5 + 173.2 = +56$$

$$+2.66 = +97$$

$$a = +36\frac{1}{2}$$

M.C. 1380

Maxwell's Equations

1913 June 12

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Conditional Equations

		c	0-c
1	$0.00 - 2.06 + 1 = +1.9$	$0 - 47 + 55 = +8$	$+11$
2	$-0.52 - 1.99 + 1 = -1.8$	$-1.9 - 46 + 55 = -1.0$	-8
3	$-1.52 - 1.38 + 1 = -1.9$	$-5.5 - 32 + 55 = -3.2$	$+13$
4	$-2.03 - 0.32 + 1 = -1.1$	$-7.4 - 7 + 55 = -2.6$	-8.4
5	$-2.06 + 0.00 + 1 = +2$	$-7.5 + 0 + 55 = -2.0$	$+22$
6	$-1.94 + 0.68 + 1 = +8.4$	$-7.1 + 16 + 55 = +0$	$+8.4$
7	$-1.52 + 1.38 + 1 = +5$	$-5.5 + 32 + 55 = +32$	-27
8	$-1.18 + 1.68 + 1 = +3.8$	$-4.3 + 39 + 55 = +5.1$	-13

+130 - 132

Normal Equations

Average = 33

$$\begin{aligned}
 +1840 - 163 - 1077 &= +42 \\
 -1.63 + 1539 - 199 &= +186 \\
 -1077 - 199 + 800 &= +1
 \end{aligned}$$

$$\begin{aligned}
 +163 - 0.14 - 0.955 &= +4 \\
 +1077 - 0.955 - 62.95 &= +24
 \end{aligned}$$

$$\begin{aligned}
 +1525 - 2945 + 190 & \\
 -2945 + 1705 &= +252
 \end{aligned}$$

$$\begin{aligned}
 +2.945 - 0.57 &= +36.2 \\
 +1135 + 62 &
 \end{aligned}$$

$$c = +55$$

$$\begin{aligned}
 -509 + 2945 + 44 & \\
 +1016 &= +234
 \end{aligned}$$

$$b = +234$$

$$\begin{aligned}
 +881 + 1.63 - 655 &= -1 \\
 -8310 - 1539 + 6180 &= +8
 \end{aligned}$$

$$\begin{aligned}
 +2721 - 1.732 &= +41 \\
 -8473 + 59.81 &= +194
 \end{aligned}$$

$$\begin{aligned}
 -2455 + 1.732 &= +56 \\
 +266 &= +97
 \end{aligned}$$

$$a = +162$$

1380

Red and brown nph

$$S = -0^{\circ} 20' 14''$$

$$\begin{array}{rcl} H + \alpha & 3 & 35 = 53^{\circ} 45' \\ I & 3 & 08 \\ q & 0 & 27 \\ G & 21 & 51 \\ G + \alpha & 22 & 18 = 334^{\circ} 30' \end{array}$$

$$\begin{array}{rcl} \log \cos S & & 0.0000 \\ 1 & & \underline{0.7914} \\ (i) & & 0.7914 \end{array}$$

$$\begin{array}{rcl} \log \cos(G + \alpha) & 9 & 9555 \\ g & & 11811 \\ \sin \dots & & 96340 \\ \tan S & & 77653 \\ & & \underline{86237} \end{array}$$

$$\begin{array}{rcl} \log \sin S & & 7.7653 \\ \cos(H + \alpha) & 9 & 7718 \\ h & & 12897 \\ \sin \dots & & 99066 \\ \sec S & & 0.0000 \\ + & & \underline{88239} \end{array}$$

$$\begin{array}{rcl} \delta' & & 11366 \\ \delta & & \underline{74043} \end{array}$$

$$\begin{array}{rcl} h' & & 88268 \\ h & & \underline{0.0202} \end{array}$$

$$\begin{array}{rcl} l & & +197 \\ \delta & & +000 \\ h & & +105 \\ & & \underline{+302} \end{array}$$

$$\begin{array}{rcl} \delta' & & +1370 \\ h' & & -007 \\ i & & +618 \\ & & \underline{+1981} \end{array}$$

MC 1380

1913 June 12

9

Moon's Mean Position (1911.0)

$$\begin{array}{rcl}
 X_0 & = & 19.5229 \\
 Y_0 & = & 21.3157 \\
 \Delta\alpha & = & +18 \\
 \Delta\delta & = & +12 \\
 \hline
 & & 19.5247 \quad 21.3169
 \end{array}$$

from plate constant $X = 19.5013$ $Y = 21.3465$

$$\begin{array}{rcl}
 Z & = & +1.5013 \\
 \log Z & & 0.17647 \\
 \log S & & 9.99999 \\
 \text{"const"} & & 8.50724
 \end{array}$$

$$\log(\alpha - A) = 1.66924$$

$$\alpha - A = +46.69$$

$$A = 0^h 26^m 01^s$$

$$X_0 = 0 26 47.69$$

$$\text{Red} = +30.2$$

$$V = 0 26 50.71$$

$$\eta = -0.6535$$

$$\begin{array}{rcl}
 \log \tan \delta & & 7.6400 \\
 \log \eta & & 0.3529 \\
 \log \eta_1 & & 5.0463
 \end{array}$$

$$\begin{array}{rcl}
 \log m_0 & = & 9.81525 \\
 \text{"const"} & & 7.33115
 \end{array}$$

$$\log(\delta - D) = 2.48410$$

$$\delta - D = -5 04.9$$

$$D = -0^{\circ} 15' 10''$$

$$\delta_0 = -0^{\circ} 20' 14.9''$$

$$\text{Red} = +19.8$$

$$\delta' = -0 19 55.1$$

1380

Red ad locum app.

$$S = -0^{\circ} 20' 14.9''$$

$$\begin{array}{rcl}
 H + \alpha & 3^h & 35^m = 53^{\circ} 45' \\
 H & 3 & 08 \\
 \alpha & 0 & 27 \\
 G & 21 & 51 \\
 G + \alpha & 22 & 18 = 334^{\circ} 30'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos S & & 0.00000 \\
 1 & & \underline{0.7914} \\
 (i) & & 0.7914
 \end{array}$$

$$\begin{array}{rcl}
 l \cos(G + \alpha) & & 9.9555 \\
 g & & 1.1811 \\
 \sin \dots & & 9.6340 m \\
 \tan S & & 7.7653 m \\
 & & 8.8237
 \end{array}$$

$$\begin{array}{rcl}
 g' & & 1.1366 \\
 g & & 74043
 \end{array}$$

$$\begin{array}{rcl}
 l & + & 1.97 \\
 g & + & 0.00 \\
 h & + & 1.05 \\
 \hline
 & + & 3.02
 \end{array}$$

$$\begin{array}{rcl}
 l \sin S & & 7.7653 m \\
 \cos(H + \alpha) & & 9.7718 \\
 a & & 1.2897 \\
 \sin \dots & & 9.9066 \\
 \sec S & & 0.0000 \\
 + & & 8.8237
 \end{array}$$

$$\begin{array}{rcl}
 h' & & 8.8268 m \\
 h & & 00202
 \end{array}$$

$$\begin{array}{rcl}
 g' & + & 13.70 \\
 h' & - & 0.07 \\
 l & + & 6.18 \\
 \hline
 & + & 19.81
 \end{array}$$

NIC 1380

1913 June 12

9

known mean Position (1911.0)

$$X = 195229$$

$$Y = 213157$$

$$+18$$

$$+12$$

$$195247$$

$$213169$$

zone plate constant $X = 195013$ $Y = 213965$

$$S = +1.5013$$

$$\eta = -0.6535$$

$$\log S = 0.17647$$

$$\log S = 999999$$

$$\log S = 850724$$

$$\log \tan S = 7.6400$$

$$15^2 = 0.3529$$

$$\eta_1 = 5.0463$$

$$(X-A) = 166924$$

$$\log \eta_0 = 9.81525$$

$$\log \eta_1 = 7.33115$$

$$A - A = +4669$$

$$A = 0^{\circ} 26' 01''$$

$$(J-D) = 248410$$

$$X_0 = 0 26 47.69$$

$$S-D = -5 049$$

$$Red = +302$$

$$D = -0^{\circ} 15' 10''$$

$$V = 0 26 50.71$$

$$S_0 = -0^{\circ} 20' 14.9''$$

$$Red = +198$$

$$d' = -0 19 55.1$$

1380 Lunar Parallax.

$$\begin{aligned}
 \alpha &= 0^h 26^m 50.71^s \\
 \delta &= 22^\circ 30' 53.0'' \\
 \alpha - \alpha' &= -1^\circ 55' 57.7'' \\
 &= -28^\circ 59' 25''
 \end{aligned}$$

$$- 10 24''$$

$$- 28 49 01''$$

$$\begin{aligned}
 9.95727 \\
 0.00000 \\
 \hline
 0.05741 \\
 0.01468
 \end{aligned}$$

$$\delta = 45 58 05''$$

$$- 0 19 55''$$

$$46 18 00''$$

$$\begin{aligned}
 9.82640 \\
 8.22700 \\
 9.85912 \\
 \hline
 0.14330 \\
 8.05582
 \end{aligned}$$

$$\delta - \delta' = +39 05.6''$$

$$\delta = +0 19 10.5''$$

$$\text{Hant Allen } \delta = +0^\circ 19' 07.6''$$

$$O - C \quad + 29''$$

$$\text{Red to Stand } \alpha \quad + 0.3''$$

$$O - C \quad + 32''$$

$$\delta' = -0^\circ 19' 55.1''$$

$$\alpha' = 57' 59.0''$$

$$486913''$$

$$822700''$$

$$968544''$$

$$\hline 000000''$$

$$778159''$$

$$\alpha - \alpha' = -20' 47.43''$$

$$= -1^m 23.16''$$

$$\alpha = 0 25 27.55''$$

$$\alpha = 0 25 26.82''$$

$$+ 0.73''$$

$$+ 0.06''$$

$$+ 0.79''$$

1380 Human Parallax

$$S = -0^{\circ} 19' 55''$$

$$\alpha = 0^{\circ} 26' 50.71$$

$$\delta = 22^{\circ} 30' 53.0$$

$$\alpha = 0^{\circ} 27' 58.9$$

$$\delta - \alpha = -1^{\circ} 55' 57.7$$

$$= -28^{\circ} 59' 25''$$

$$= 10^{\circ} 24'$$

$$= 28^{\circ} 49' 01''$$

$$9.95727$$

$$0.00000$$

$$0.05741$$

$$0.01468$$

$$\delta = 45^{\circ} 58' 05''$$

$$= 0^{\circ} 19' 55''$$

$$46^{\circ} 18' 00''$$

$$9.82640$$

$$8.22700$$

$$9.85912$$

$$0.14330$$

$$8.05582$$

$$S - S' = +39^{\circ} 05.6$$

$$S = +0^{\circ} 19' 10.5$$

$$\text{Hamblen } S = +0^{\circ} 19' 07.6$$

$$O - C = +2.9$$

$$\text{Red Island } \alpha = +0.3$$

$$O - C = +3.2$$

$$9.86913$$

$$8.22700$$

$$9.68544$$

$$0.00000$$

$$7.78158$$

$$\alpha - \alpha' = -20^{\circ} 47.4$$

$$= -1^{\circ} 23.16$$

$$\alpha = 0^{\circ} 25' 27.55$$

$$\alpha = 0^{\circ} 25' 26.82$$

$$+07.3$$

$$+0.6$$

$$+07.9$$

1
6
152
14
113
23
2

1381 Stars - Measures,

1913 May 30.

11.

	α	δ	α	δ	α	δ	α	δ
1	16088	15800	14940	14742				
85	11195	10690	9820	9839				
195	9600	8489	14	3532				
	92	92	36	28				
	<u>194893</u>	<u>4892</u>	<u>84879</u>	<u>4900</u>				
2								
148	17669	16648	18330	18302				
11.3	15390	8919	16215	10368				
	90	1817	20	66				
	61	40	20	89				
	<u>112277</u>	<u>2276</u>	<u>147891</u>	<u>7924</u>				
3								
235	17120	17788	16110	16309				
275	11857	13035	11585	10800				
	5660	40	89	01				
	14	76	94	97				
	<u>275259</u>	<u>5256</u>	<u>235484</u>	<u>5501</u>				

Remeasure (2)

18112	15581
16005	764036
12	40
0709	50
98	<u>7917</u>
<u>7899</u>	

1381 Stars - measures

1913 May 30.

11.

	α	δ	α	δ
1	16088	15800	14940	14742
85	11195	10690	9820	9839
195	9600	8489	1417	3532
	97	92	36	28
	<u>194893</u>	<u>4892</u>	<u>84879</u>	<u>4900</u>
2				
148	17669	16645	18330	18302
11.3	15890	8919	16215	10368
	90	1817	20	66
	61	40	20	89
	<u>112277</u>	<u>2276</u>	<u>147891</u>	<u>7924</u>
3				
235	17120	17788	16110	16309
275	11857	13035	11585	10800
	56	40	89	01
	14	76	94	97
	<u>275259</u>	<u>5256</u>	<u>235484</u>	<u>5501</u>

Remeasure (2)

18112
16005
0709
98
7899

15581
764036
40
50
7917

MC1381

moon measures.

1913 May 30. 12

	d	N
1	18886	18290
18.5	1434864	1281212
19.5	6054	13
min	76	80
in	19.4524	4527
g.		

2	17904	18280
18.0	1319505	1296060
19.5	95	60
	90	70
	19.4700	4685

3	17938	17228
17.0	905560	1608398
19.8	64	90
	20	16
	19.8862	8864

4	
16.3	
21.0	

5	
16.2	
21.5	
min	
in	
22	

6	
16.3	
22.0	

16394	17380
907080	1464551
62	48
70	60
16.2694	2727

15345	16428
739590	1435048
88	38
25	10
16.2060	2079

14322	16458
697570	1378880
60	82
03	46
16.2660	2672

M61381

Moon measures.

1913 May 20. 12

	d	V	d	V
1	18886	18290		
18.5	1934864	1281212		
19.5	6054	13		
mm	76	80		
W	19.4524	4527		

2	17904	18280
18.0	1319501	1296060
19.5	95	60
	90	70
	194700	4685

3	17938	17228
17.0	905560	1608398
19.8	64	90
	20	16
	198862	8864

4
16.3
21.0

16394	17380
907080	1464551
62	48
70	60
162694	2727

15345	16428
739590	1435048
88	38
25	10
162060	2079

14322	16458
697570	1378880
60	82
03	46
162660	2672

MIC 1384

unovis measures

1913 May 30 13

d	u	N	d	u	N
2 scratch:			18		
16.6	16815	14526	18243		15484
22.5	11870	946058	12835	30	1087370
	6967	70	30		80
	11	12	35		70
<u>22.4944</u>		<u>.4944</u>	<u>16.4593</u>		<u>.4603</u>
6	16710	17913			
17.0	15356	925250			
22.2	5750	5550			
	00	91			
<u>23.1355</u>		<u>.1358</u>			

NIC 1384

1918 May 20 13

unovis measures

d	u	v	d	u	v
7 scratch			~~18~~		
16.6	16815	14526	18243	15484	
22.5	11870	946058	12835	1087370	
	6967	70	20	80	
	11	12	35	70	
<u>224944</u>		<u>4944</u>	<u>164593</u>	<u>4603</u>	
8	16710	17913			
17.0	15356	925250			
23.2	5750	5550			
	00	91			
<u>23.1355</u>		<u>1358</u>			

Times etc.

Cy. total 19.11 Nov 3	22 ^h	29 ^m	- 22 ^h 51 ^m
noon	22	44	419 - 22 422
Clock slow		0	432
H Sid T.	22	45	2525
H Long	4	44	31.05
G S. & P.	27	29	56.30
Sid T in noon	14	46	30.61
Interval	12	43	2569
Reduction		2	0507
G. M. T.	12	41	2062

Forham Alum		RG		Reel
noon 13 ^h	0 ^h	26 ^m	33 ^s 19	+0 27 592
Position in	20021		16035	
-18.6563		-37.35		-4 592
Tabular place	0	25	5584	+0 23 00.0
Provis farallan		57'	59' 5"	
seminichan		15'	49' 7"	

MC1381

1913 June 2

14

Preliminary Reduction + Plate constant

x	8.4890	1479.08	23.5492
y	103629	167229	253728
$x - \bar{x}$	-1.8739	-1.9321	-1.8236
y	194892	112276	275258
y	197638	115404	279016
$y - \bar{y}$	-2746	-3128	-3758

$$\begin{array}{rclcl}
 x - \bar{x} & -684 & +3x = .24 & +2.004 & \\
 -1.8739 & -1325 = -2.0064 & +25 = 4 = -2.0043 & = 0 & \\
 -1.9321 & -763 = -2.0084 & +44 = 2 = -2.0042 & = +1 & \\
 -1.8236 & -1872 = -2.0108 & +71 = 6 = -2.0043 & = 0 & \\
 18.2666 & -1465 & +55 = 4 & = 20.1297 &
 \end{array}$$

$$\begin{array}{rclcl}
 y - \bar{y} & +668 & +3y & -.6x + .4y & +2124 \\
 -2746 & +560 = -2186 & +58 = -2128 & -5 + 8 = -2125 & = -1 \\
 -3128 & +976 = -2152 & +34 = -2118 & -9 + 4 = -2123 & = +1 \\
 -3758 & +1554 = -2204 & +83 = -2121 & -14 + 11 = -2124 & = 0 \\
 21.5108 & +1206 & +65 & -11 + 9 = 21.8501 &
 \end{array}$$

$$\begin{array}{rclcl}
 \text{Tabular } b + a & +29 & a = -0.1 & a = -2.6 & \\
 \text{Observed} & +2.8 & -3.0 & -3.4 &
 \end{array}$$

Times etc

Cyrtana 1911 Nov. 3	22 ^h	29 ^m	- 22 ^h 51 ^m
noon	22	44	41.9 ^v - 22 42.2 ^v
Clock slow		0 43.2 ^v	
		53 ^v	
H Sid T.	22	45	25.25 ^v
H Long	4	44	31.05 ^v
G Sid T.	27	29	56.30 ^v
Sid T. in noon	14	46	30.61 ^v
Interval	12	43	25.69 ^v
Reduction		2	05.07 ^v
G. in T.	12	41	20.62 ^v

Inkaut Alm

noon 13 ^h	0 ^h	26 ^m	33.519 ^v	+ 0	27	59.2 ^v
Correction	2.0021 ^v			16.035 ^v		
	-18.6563 ^v		-37.35 ^v	- 4	59.2 ^v	
Tabulaphase	0	25	55.84	+ 0	23	00.0 ^v
Proon's farallax		57'	59".5 ^v			
semidiam.		15'	49".7 ^v			

M1381

1913 June 2

14

Preliminary Reduction + Plate correction

	1	2	3
α	8.4890	14.7908	23.5492
δ	10.3629	16.7229	25.3728
$\alpha - \delta$	-1.8739	-1.9321	-1.8236
η	19.4892	11.2276	27.5258
γ	19.7638	11.5404	27.9016
$\eta - \gamma$	-2.746	-3.128	-3.758

$$\begin{array}{rclcl}
 \alpha - \delta & = & 6.84 & + 32. = & 24 & + 2.0043 \\
 -1.8739 & - & 1.325 & = & -2.0064 & + 25 = 4 = -2.0043 & = 0 \\
 -1.9321 & - & 7.63 & = & -2.0084 & + 44 = 2 = -2.0042 & = +1 \\
 -1.8236 & - & 1.872 & = & -2.0108 & + 71 = 6 = -2.0043 & = 0 \\
 15.2666 & - & 1.463 & & + 55 = 4 & = 20.1297
 \end{array}$$

$$\begin{array}{rclcl}
 \eta - \gamma & + & 6.68 & + 34 & - 62 + 44 & + 2.124 \\
 -2.746 & + & 5.60 & = & -2.186 & + 58 = -2.128 & - 5 + 8 = -2.125 = -1 \\
 -3.128 & + & 9.76 & = & -2.152 & + 34 = -2.118 & - 9 + 4 = -2.123 = +1 \\
 -3.758 & + & 15.54 & = & -2.204 & + 83 = -2.121 & - 14 + 11 = -2.124 = 0 \\
 21.5108 & + & 12.06 & & + 65 & - 11 + 9 = 21.8501
 \end{array}$$

$$\begin{array}{rclcl}
 \text{Tabular } b + a & = & +29 & a & = & -0.1 & z & = & -2.6 \\
 \text{Observed} & & +28 & & & -3.0 & & & -3.4
 \end{array}$$

Formation of Normals

	ab	ac	bc
1	- 0.00 +	0.0 -	47.5 +
2	+ 0.54 -	7.1 -	55.2 -
3	+ 2.06 -	33.0 -	42.2 -
4	+ 1.02 -	16.0 -	4.1 -
5	- 0.00 +	20.6 +	0.0 -
6	- 0.98 +	64.0 -	15.6 -
7	- 1.77 +	167.8 -	91.2 -
8	- 20.6 -	607.1 +	78.0 -
	- 1.19 +	135.6 -	177.8 -

$$[ac] = - 10.65 \quad [aa] = + 18.74$$

$$[bc] = - 3.14 \quad [bb] = + 15.16$$

pt	pos. L	resid.
1	180.0	- 15
2	187.4	- 4
3	218.0	+ 21
4	255.6	+ 24
5	270.0	+ 9
6	283.7	- 13
7	298.5	- 77
8	322.0	+ 53

1381.

Woods Center

1913 June 12

15

	x	$x - x_0$	Δx	$(x - x_0)^2$	R^2	$0 - C$
1	18.2654	0.0000 + 6		0.0000	4.2403	+23
2	18.0000	-0.2654 + 6		0.0701	4.2407	+27
3	17.0000	-1.2654 + 5		1.6000	4.2406	+26
4	16.2710	-1.9944 + 1		3.9772	4.2388	+8
-5	16.2070	-2.0584 - 0		4.2370	4.2370	-10
6	16.2666	-1.9988 - 1		3.9956	4.2348	-32
7	16.4598	-1.8056 - 3		3.2612	4.2287	-93
✓	17.0000	-1.2654 - 5		1.6025	4.2428	+48
			Mean		4.2380	-3

	y	$y - y_0$	Δy	$(y - y_0)^2$
-1	19.4526	-2.0588 - 4		4.2403
2	19.4692	-2.0418 - 4		4.1706
3	19.8863	-1.6247 - 3		2.6406
4	21.0000	-0.5110 - 1		0.2612
5	21.5110	0.0000 + 0		0.0000
6	22.0000	+0.4890 + 1		0.2392
7	22.4944	+0.9834 + 2		0.9675
✓	23.1356	+1.6246 + 3		2.6403

Approximate Center

$$x = 17.0 \quad y = 19.8863$$

$$23.1356$$

$$43.0219$$

$$\text{Mean } y = 21.5110$$

$$y - \text{min} = 19.4526$$

$$R = 2.0584$$

$$x - \text{min} = 16.2070$$

$$\text{Mean } x = 21.5110$$

$$18.2654$$

Assume $\begin{cases} x_0 = 18.2654 \\ y_0 = 21.5110 \end{cases}$
Center

1381.

Known Center

1913 June 12

15

	x	$x - x_0$	$(x - x_0)^2$	R^2	$0 - C$
1	18.2659	0.0000 + 6	0.0000	4.2403	+23
2	18.0000	-0.2659 + 6	0.0701	4.2407	+27
3	17.0000	-1.2659 + 5	1.6000	4.2406	+26
4	16.2710	-1.9949 + 1	3.9772	4.2388	+8
5	16.2070	-2.0584 - 0	4.2370	4.2370	-10
6	16.2666	-1.9988 - 1	3.9956	4.2348	-3.2
7	16.4598	-1.8056 - 3	3.2612	4.2287	-9.3
Σ	17.0000	-1.2654 - 5	1.6025	4.2428	+48
		mean		4.2380	-3

	y	$y - y_0$	$(y - y_0)^2$
1	19.4526	-2.0588 - 4	4.2403
2	19.4692	-2.0418 - 4	4.1706
3	19.8863	-1.6247 - 3	2.6406
4	21.0000	-0.5110 - 1	0.2612
5	21.5110	0.0000 + 0	0.0000
6	22.0000	+0.4890 + 1	0.2392
7	22.4944	+0.9834 + 2	0.9675
Σ	23.1356	+1.6246 + 3	2.6403

Approximate Center

$$x = 17.0 \quad y = 19.8863$$

$$23.1356$$

$$4.30219$$

$$\text{mean } y = 21.5110$$

$$y - \text{mean} = 19.4526$$

$$R = 2.0584$$

$$x - \text{mean} = 16.2070$$

$$\text{mean } x = 21.5110$$

$$18.2654$$

$$\text{Assume } \begin{cases} x_0 = 18.2654 \\ y_0 = 21.5110 \end{cases}$$

$$\text{Center}$$

MC1381 conditional equations

1	0.00	-2.08	+1	= +23	00	+6	+32	= +38	-15
2	-0.27	-2.04	+1	= +27	-7	+6	+32	= +31	-4
3	-1.27	-1.62	+1	= +26	-32	+5	+32	= +5	+21
4	-1.99	-0.51	+1	= +8	-50	+2	+32	= -16	+24
5	-2.06	+0.00	+1	= -10	-51	-0	+32	= -19	+9
6	-2.00	+0.49	+1	= -32	-50	-1	+32	= -19	-13
7	-1.81	+0.98	+1	= -93	-45	-3	+32	= -16	-77
8	-1.27	+1.62	+1	= +48	-32	-5	+32	= -5	+53

Normal Equations

$$\begin{array}{r} + 18.74 - 1.19 - 10.65 = + 13.6 \\ - 1.19 + 15.16 - 3.14 = - 1.78 \\ - 10.65 - 3.14 + 8.00 = - 5.79 \end{array}$$

$$\begin{array}{r} + 1.19 - 0.08 - 0.68 = + 9 \\ + 10.65 - 0.68 - 6.05 = + 77 \end{array}$$

$$\begin{array}{r} + 15.08 - 3.82 = -1.69 \\ - 382 + 1.95 = + 74 \end{array}$$

$$\begin{array}{r} + \quad 3.82 - \quad 0.97 = - \quad 43 \\ + \quad 0.98 = + \quad 31 \end{array}$$

$$\begin{array}{r} - \quad 7.49 + \quad 3.82 = + 145 \\ + \quad 7.59 \quad \quad \quad = - \quad 24 \end{array}$$

$$+ 4.04 + 1.19 - 3.03 = + 1.1$$

$$\begin{array}{r} + 22.78 \\ - 52.59 \\ \hline \end{array} \quad \begin{array}{r} - 13.68 = +136 \\ + 35.46 = -192 \end{array}$$

$$\begin{array}{r} - 20.30 \\ + 2.48 \\ \hline \end{array} \quad \begin{array}{r} + 13.68 = - 74 \\ = + 62 \end{array}$$

$$-109 + 107$$

Average: 27

$$\frac{\Delta x}{\Delta t} = +1.20$$

$$\frac{\Delta_4}{\Delta_2} = +0.52$$

$$c = +32$$

$$t = -3 +$$

$$a = +25$$

MC1381

Conditioed Equations

1912 16

1	000	-208	+1	= +23	00	+6	= 32	= +38	-15
2	-0.27	-204	+1	= +27	-7	+6	= 32	= +31	-4
3	-1.67	-162	+1	= +26	-32	-5	= 32	= -5	+21
4	-1.99	-0.51	+1	= +6	-50	+2	= 32	= -16	+24
5	-2.06	+0.00	+1	= -10	-51	-0	= 32	= -19	+9
6	-2.00	+0.49	+1	= -32	-50	-1	= 32	= -19	-13
7	-1.81	+0.98	+1	= -95	-95	-3	= 32	= -16	-77
8	-1.27	+1.62	+1	= +47	-32	-5	= 32	= -5	+53

Normal Equations

-109 + 107

Average = 27

$$\begin{aligned}
 + 18.34 - 119 - 10.65 &= +1.36 \\
 - 1.19 + 15.16 - 31.4 &= -1.78 \\
 - 10.65 - 31.4 + 8.00 &= -3
 \end{aligned}$$

$$\begin{aligned}
 + 1.19 - 0.08 - 0.68 &= +9 \\
 + 10.65 - 0.68 - 2.05 &= +77
 \end{aligned}$$

$$+ 15.08 - 382 = -169$$

$$- 382 + 195 = +74$$

$$+ 382 - 0.97 = +43$$

$$+ 0.98 = +31$$

$$G = +32$$

$$= 7.49 + 382 = +145$$

$$+ 7.59 = +24$$

$$f = -3$$

$$+ 404 + 1.19 - 303 = +1$$

$$- 5140 - 15.16 + 38.60 = -14$$

$$+ 2278 - 1368 = +136$$

$$- 5259 + 33.46 = -192$$

$$- 2030 + 1368 = -74$$

$$+ 2.48 = +62$$

$$a = +25$$

MC 1381

1913 July 2

17

Moon's Mean Position (1911.0)

$$\begin{array}{rcl}
 X_0 = 18.2654^{\circ} & Y_0 = 21.5110^{\circ} \\
 \frac{1}{2} \Delta = +12^{\circ} & \frac{1}{2} \Delta = -2^{\circ} \\
 \hline
 18.2666^{\circ} & 21.5108^{\circ}
 \end{array}$$

from Photo Comparison $X = 20.1297^{\circ}$ $Y = 21.8501^{\circ}$

$$\begin{array}{rcl}
 \delta = +2.1297^{\circ} & \eta = -0.1499^{\circ} \\
 \log 3 = 0.32832^{\circ} & \log \tan S = 7.7650 \\
 \log \cos \delta = 0.00000^{\circ} & \log 32 = 0.6566 \\
 \log \cos \delta = 9.50724^{\circ} & \log \eta_1 = 5.4750 \\
 (K-A) = 1.82108^{\circ}
 \end{array}$$

$$\begin{array}{rcl}
 \log \eta_0 = 9.17580^{\circ} \\
 K-A = +1.0623^{\circ} \text{ const} = 7.33115^{\circ}
 \end{array}$$

$$A = 0.2601^{\circ} \quad (t-D) = 1.84465^{\circ}$$

$$d_0 = 0.270723^{\circ} \quad S-D = -0.1099^{\circ}$$

$$\text{Red} = +3.02^{\circ} \quad D = -0^{\circ} 15' 10''$$

$$V = 0.271025^{\circ} \quad S_0 = -0^{\circ} 16' 19.9''$$

$$\text{Red} = +19.8^{\circ}$$

$$S = -0^{\circ} 16' 00.7''$$

M 61381

1913 July 2

17

Moon's Mean Position (1911.0)

$$X_0 = 182659$$

$$Y_0 = 215110$$

$$\Delta X = +12$$

$$\Delta Y = -2$$

$$182666$$

$$215108$$

Moon's Position X = 201297 Y = 218501

$$\delta = +21297$$

$$\eta = -01499$$

$$\log S = 0.32832$$

$$\log \mu S = 77650$$

$$\cos S = 0.00000$$

$$32 = 06566$$

$$\cos \delta = 950724$$

$$\eta = 54750$$

$$(h-A) = 182108$$

$$\log \mu_0 = 9.17580$$

$$h-A = +106.23$$

$$733115$$

$$A = 02601$$

$$(h-D) = 184465$$

$$d_0 = 02707.23$$

$$S-D = 01099$$

$$Red = +302$$

$$D = -01510$$

$$V = 02710.25$$

$$S_0 = -01619.9$$

$$Red = +19.8$$

$$S = -01600.7$$

1381

Red. ad locum alt.

18

$$\begin{array}{rcl}
 H + a & 3 & 35 = 53^\circ 45' \\
 H & 3 & 08 \\
 a & 0 & 27 \\
 G & 21 & 51 \\
 a + \alpha & 22 & 18 = 334^\circ 30'
 \end{array}$$

$$\delta = -0^\circ 16' 20''$$

$$\begin{array}{rcl}
 h \cos S & 0.0000 \\
 i & 0.7914 \\
 (i) & 0.7914
 \end{array}$$

$$\begin{array}{rcl}
 h \cos(G + \alpha) & 9.9555 \\
 q & 1.1811 \\
 \sin \dots & 9.6340 m \\
 \tan S & 7.6768 m \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 h \sin S & 7.6768 m \\
 h \cos(H + \alpha) & 9.7718 \\
 h & 1.2898 \\
 \sin \dots & 9.9066 \\
 \sec S & 0.0000 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 g' & 1.1366 \\
 g & 7.3158
 \end{array}$$

$$\begin{array}{rcl}
 h' & 8.7384 m \\
 h & 0.0203
 \end{array}$$

$$\begin{array}{rcl}
 h & +1.97 \\
 g & 0.00 \\
 h & +1.05 \\
 \hline
 & +3.02 \checkmark
 \end{array}$$

$$\begin{array}{rcl}
 g' & +13.70 \\
 h' & -0.05 \\
 L & +6.18 \\
 \hline
 & +19.83 \checkmark
 \end{array}$$

1381

Red. ad locum ahp

18

$$H + \alpha \quad 3 \quad 35 = 53^{\circ} 45'$$

$$H \quad 3 \quad 08$$

$$\alpha \quad .0 \quad 27$$

$$G \quad 21 \quad 51$$

$$G + \alpha \quad 22 \quad 18 = 334^{\circ} 30'$$

$$l \cos(G + \alpha) \quad 99555$$

$$q \quad 11811$$

$$\sin \dots \quad 96340$$

$$l \sin S \quad 76768$$

$$88239$$

$$8 \quad 11366$$

$$8 \quad 73158$$

$$h \quad +197$$

$$8 \quad 600$$

$$h \quad +105$$

$$+302$$

$$S = -0^{\circ} 16' 20''$$

$$l \cos S \quad 00000$$

$$i \quad 07914$$

$$(i) \quad 07914$$

$$l \sin S \quad 76768$$

$$l \cos(11 + S) \quad 97718$$

$$h \quad 12898$$

$$\sin \dots \quad 99066$$

$$l \cos S \quad 00000$$

$$88239$$

$$h' \quad 87384$$

$$h \quad 00203$$

$$8 \quad +1370$$

$$h' \quad -005$$

$$i \quad +618$$

$$+1983$$

1381 Lunar Parallax.

$$\begin{aligned} \alpha' &= 0^h 27^m 10.25^s \\ \theta &= 22 45 25.25 \\ \theta - \alpha &= -1 41 45.00 \\ &\quad - 25 26 15 \end{aligned}$$

$$- \quad \quad \quad 9 13$$

$$+ 25 17 02$$

$$9.95727$$

$$0.00000$$

$$0.04373$$

$$0.00100$$

$$\delta = 45^\circ 04' 00''$$

$$- 0 16 00''$$

$$45 20 00''$$

$$9.82640$$

$$8.22707$$

$$9.85200$$

$$0.15001$$

$$8.05548$$

$$S - S' = +39 03.8$$

$$S = +0 23 03.7$$

$$\text{Nautical } S = +0 23 00.0$$

$$O - C \quad \quad \quad +3.7$$

$$\text{Red. Island n.} \quad \quad \quad +0.1$$

$$O - C \quad \quad \quad +3.8$$

$$\delta' = -0^\circ 16' 00''$$

$$\pi = 57' 59.5''$$

$$9.86913$$

$$8.22707$$

$$9.63299$$

$$0.00001$$

$$7.72920$$

$$\alpha - \alpha' = -18' 25.67''$$

$$= -1'' 13.71''$$

$$\alpha = 0 25 56.54$$

$$\alpha' = 0 25 55.84$$

$$+0.70$$

$$+0.02$$

$$+0.72$$

1913phae-proj

1381 Lunar Parallax

$\alpha' = 0^h 27^m 10^s.25$
 $\theta = 22^\circ 45' 25.25''$
 $G - \alpha = -1^\circ 41' 45.00''$
 $- 25^\circ 26' 15''$

$S = -0^\circ 16' 00.1''$

$\pi = 57' 59.5''$

$- 9 13$

$- 25 17 02$

995727

000000

004373

000100

986913

822707

963299

000001

772920

$\alpha - \alpha' = -18' 25.67''$

$= -1^h 13^m 71^s$

$\delta = 45^\circ 04' 00''$

$- 0^\circ 16' 00''$

45 20 00

982640

822707

985204

015001

805548

$S - S' = +39' 03.8''$

$S - T_0 = 23' 03.7''$

$\alpha = 0^h 25^m 56.54^s$

Mountains $S = +0^\circ 23' 00.0''$

$\alpha = 0^h 25^m 55.84^s$

O-C +3.7

+0.70

Red Island n. +0.1

+0.02

O-C +3.8

+0.72

MC 1397

1913 May 31 20

Steps - Measures.

	d	N	d	N
1				
8.3	18648	15488	18828	16290
39.6	1257574	1155058	1168180	1340919
	77	61	80	10
	46	78	28	84
	<u>34.6072</u>	<u>.6072</u>	<u>82852</u>	<u>.2875</u>
2				
187	16354	17810	16830	16510
127	878285	153828580	1369092	963635
	82	85	90	30
	51	13	29	07
	<u>127569</u>	<u>.7571</u>	<u>136861</u>	<u>.6874</u>
3				
24.1	14206	18645	15200	17920
32.4	1137067	1199891	642830	1666269
	60	92	30	60
	16	47	99	20
	<u>3233.43</u>	<u>.3348</u>	<u>29.1230</u>	<u>.1256</u>
4				
28.0	15414	19199	10040	881615
12.1	1457061	1006055	982120	0519
	70	56	26	8620
	14	07		
	<u>12.0847</u>	<u>.0851</u>	<u>27.9782</u>	<u>.9806</u>

VIC 1397

1913 May 31 20

Stars - Measures

	d	N	d	N
<u>1</u>				
83	18648	15488	18828	16290
34.6	1257574	1155058	1168180	1340919
	77	61	80	10
	46	78	28	84
	<u>34.6072</u>	<u>.6072</u>	<u>8.285-2</u>	<u>.2875-</u>
<u>2</u>				
137	16354	17810	16830	16510
127	878285-	15382	1369092	963635-
	82	85-80	90	30
	51	13	29	07
	<u>127569</u>	<u>.7571</u>	<u>13.6861</u>	<u>6874</u>
<u>3</u>				
241	14706	18645-	15200	17920
324	1137067	1199891	642830	1666269
	60	92	30	60
	16	47	99	20
	<u>323343</u>	<u>3348</u>	<u>29.1230</u>	<u>.1256</u>
<u>4</u>				
28.0	15414	19199	10040	881615-
12.1	1457061	1006055-	982120	0519
	70	56	26	8620
	14	07		
	<u>12.0847</u>	<u>0851</u>	<u>27.9782</u>	<u>.9806</u>

NIC 1397 Snow-on-Measures

May 31

21

	d	y	v	d	x	v
1	17362		16440			
18.2	1188696		1192110			
20.5	0596		21			
	76		60			
	<u>20.5473</u>		<u>.5467</u>			

2	16373		15448			
18.2	1069810		1113529			
20.5	9910		31			
	80		60			
	<u>20.5675</u>		<u>.5678</u>			

3	1002021		11355			
17.0	50		1103936			
20.9	9705		22			

hard front
to measure.

4	20.9691		9677			
16.7	18730		14755			
21.5	1634860		713238			
	2560		4038			
	39		55			
	<u>21.2384</u>		<u>.2382</u>			

17630	15230
1458890	826068
9190	62
20	28
<u>16.6963</u>	<u>.6966</u>

17305	14245
984035	1168095
30	99
02	37
<u>16.2532</u>	<u>.2552</u>

17240	18300
862020	16890
22	9097
40	00
<u>16.1381</u>	<u>.1408</u>

5-
16.3
22.0

6
16.2
22.5
22.0
22.0

NIC 1397 Moon-Measures

M13 May 31

21

	d	y		d	y
1	17362		16440		
182	1188696		1192110		
20.5	05	96	21		
	76		60		
	<u>205473</u>		<u>5467</u>		

2	16373		15448		
180	1069810		1113529		
20.5	99	10	31		
	80		60		
	<u>205675</u>		<u>5678</u>		

3	1002021		11355		
170	00	21	1103936		
20.9	97	05	22		

hard front
a measur

4	20.9691		9677		
16.7	18.730		14755		
21.5	1634860		713238		
	25	60	40	38	
	39		55		
	<u>21.2384</u>		<u>2382</u>		

5
16.3
22.0

17630	15230
14588	826068
9190	62
20	28
<u>16.6963</u>	<u>6966</u>

17305	14245
984035	1168095
30	99
02	37
<u>162532</u>	<u>2552</u>

17240	18300
862020	16890
22	9097
40	00
<u>161381</u>	<u>1408</u>

6
16.2
22.5
m
n
76

NK1397

Moon-Measures.

1918 May 31

$$\begin{array}{r} 7 \\ 16.2 \\ 23.0 \end{array}$$

$$\begin{array}{r} 8 \\ 16.6 \\ 24.0 \end{array}$$

$$\begin{array}{r} 9 \\ 17.0 \\ 24.4 \end{array} \begin{array}{r} 14690 \\ 10835 \\ 37 \\ 00 \end{array} \begin{array}{r} 45 \\ 45 \end{array}$$

$$\underline{248854}$$

$$\begin{array}{r} 15452 \\ 9300 \\ 05 \\ 55 \end{array}$$

$$\underline{.3854}$$

$$\begin{array}{r} 16209 \\ 781009 \\ 10 \\ 00 \\ \hline 16.1609 \end{array}$$

$$\begin{array}{r} 18297 \\ 1666072 \\ 70 \\ 00 \\ \hline .1631 \end{array}$$

$$\begin{array}{r} 16153 \\ 1224853 \\ 50 \\ 50 \\ \hline 166099 \end{array}$$

$$\begin{array}{r} 17330 \\ 1121025 \\ 26 \\ 34 \\ \hline .6112 \end{array}$$

NK1397

moon-measures.

1918 May 31 22

$$\begin{array}{r} 7 \\ 162 \\ \hline 230 \end{array}$$

$$\begin{array}{r} 8 \\ 166 \\ \hline 240 \end{array}$$

$$\begin{array}{r} 9 \\ 170 \\ 244 \\ \hline 14690 \\ 10835 \\ 37 \\ 00 \\ \hline 24.3854 \end{array}$$

$$\begin{array}{r} 15452 \\ 9300 \\ 05 \\ 55 \\ \hline 3854 \end{array}$$

d	x
$\begin{array}{r} 16209 \\ 781009 \\ 10 \\ 00 \\ \hline 161609 \end{array}$	$\begin{array}{r} 18297 \\ 1666072 \\ 70 \\ 00 \\ \hline 1631 \end{array}$
$\begin{array}{r} 16153 \\ 1224853 \\ 50 \\ 50 \\ \hline 166099 \end{array}$	$\begin{array}{r} 17330 \\ 1121025 \\ 26 \\ 34 \\ \hline 6112 \end{array}$

MC1377 Standard Cordo-Stat. 1913 June 2.

Cape no. 324 mag. 8.1

Cape no. 334 mag. 7.1

C $2^h 10^m 28^s.15$
 L 22
 B 18.5
Mean $2 10 28.18$
Prec $+35.98$
 K $2 11 04.16$
 A $2 16 19$
 $A-A$ $- 5 14.84$
 $\sin(A-A)$ $-3 14.81$
 $\log$ $249804m$
 $\cos$ 9.98411
 E_0 $098939m$
 E_0 -97586
 B_1 $- 58$
 B 8.2356
 $2L$ 8.2864
 $2L - B$ $+508$

$2^h 13^m 26^s.53$
 54
 59
 $2 13 26.55$
 $+35.60$
 $2 14 02.15$
 $2 16 19$
 $- 2 16.85$
 $- 136.85$
 $213625m$
 9.98944
 $063293m$
 -42947
 $- 11$
 13.7042
 13.6868
 $- 174$

C $+15^{\circ} 21' 18''.4$
 L 17.8
 B 18.9
Mean $+15 21 18.4$
Prec $+ 3 05.6$
 S $+15 24 24.0$
 D $+13 46 50$
 $S-D$ $+ 1 37 34.0$
 $\tan(S-D)$ $+58556$
 $\log$ 3.76757
 $\log$ 109872
 $\tan$ 9.4402
 B_2 19788
 B_1 84724
 B_0 $+12.5523$
 B_1 $+ 297$
 B_2 345820
 B_3 346072
 $B - M$ $+ 252$

$+12^{\circ} 31' 47''.1$
 46.5
 48.0
 $+12 31 47.2$
 $+ 3 04.0$
 $+12 34 51.2$
 $+13 46 50$
 $- 1 11 58.8$
 -43194
 $3.63542m$
 $096657m$
 93487
 12659
 7.6680
 -92592
 $+ 47$
 127455
 12.7570
 $+115$

MC1397 Glandorp Woods - Star. 1913 June 2.

Capu m 329 mag 8.1	Capu m 329 mag 7.1
C 2 ^h 10 ^m 28 ^s 15	2 ^h 13 ^m 26 ^s 53
L 23	54
E 18	59
Mean 2 10 28 18	2 13 26 55
Procc + 35 98	+ 35 60
A 2 11 04 16	2 14 02 15
A 2 16 19	2 16 19
A-A - 5 14 84	- 2 16 85
sin(A-A) - 3 14 81	- 1 36 85
log 249804 m	213625 m
cos 998411	998944
Bo 098939 m	063293 m
B ₀ - 9 7 586	- 4 2 947
B ₁ - 54	- 11
B 82356	13 7042
2 82864	13 6868
2-3 + 508	- 174

L +15° 21' 18.4	+12° 31' 47.1
L 17.8	46.5
E 18.9	48.0
Mean +15 21 18.4	+12 31 47.2
Procc + 3 05.6	+ 3 04.0
S +15 24 24.0	+12 34 51.2
D +13 46 50	+13 46 50
S-D + 1 37 34.0	- 1 11 58.8
tan(S-D) + 58 55.6	- 43 19.4
log 3.76757	3.63542 m
log 009872	096657 m
tan 94402	93487
S 19788	12659
2 84724	76680
2 ₁ +12.5523	- 92592
2 ₁ + 297	+ 47
2 345820	127455
2 346072	127570
2-2 + 252	+ 115

MC 1397 ~~Standard Crosses~~ Stars 4 1913 June 2.

Cape no. 348 mag 8.2

Cape no. 355 mag 8.2

C 2 18 58.79
 L 76
 E 74
 mean 2 18 58.76
 Prec + 36.06
 A 2 19 3482
 A 2 16 19
 A-A + 3 15.82
 sin(A-A) + 195.81
 log... 2.29183
 ... 9.98470
 ... 0.78377
 ... + 60781
 ... + 21
 ... 240802
 ... 24.1243
 ... + 441

C + 15° 04' 17.8
 L 180
 E 179
 mean + 15 04 17.9
 Prec. + 3 01.0
 S + 15 07 18.9
 D + 13 46 50
 S-D + 1 20 28.9
 tan(S-D) + 4829.7
 log... 3.68392
 ... 1.01507
 ... 94317
 ... 15675
 ... 80526
 ... + 10.3531
 ... + 113
 ... 32.3644
 ... 32.3346
 ... - 298

2 21 0186
 89
 84
 2 21 0186
 + 35.68
 2 21 3754
 2 16 19
 + 5 18.54
 + 318.51
 2.50312
 9.98958
 0.99994
 + 9.9986
 + 48
 28.0034
 27.9794
 - 240

+ 12 26 533
 3
 4
 + 12 26 533
 + 2 599
 + 12 29 53.2
 + 13 46 50
 - 1 16 56.8
 - 4617.6
 3.66441
 0.99556
 93457
 1.9999
 8.3990
 - 9.8982
 + 251
 12.1269
 12.0849
 - 420

MC 1397 Standard Catalog Stars				1913 June 2			
Cape no. 348 mag 7.8				Cape no. 355 mag 8.2			
C	2	18	58.79	2	21	01.86	
L			76			89	
E			74			84	
mean	2	18	58.76	2	21	01.86	
Procr			+ 3.606			+ 3.568	
A	2	19	3482	2	21	3754	
A	2	16	19	2	16	19	
A-A			+ 3 1582			+ 5 1854	
mid-A			+ 19581			+ 31851	
log	2	29	183	2	50	312	
log	9	98	470	9	98	958	
log	0	78	377	0	99	994	
log			+ 60781			+ 99986	
log			+ 21			+ 48	
log	2	40	802	2	80	034	
log	2	41	243	2	79	794	
2-8			+ 441			- 240	
C	+ 15	04	17.8	+ 12	26	53.3	
L			180			3	
E			179			4	
mean	+ 15	04	17.9	+ 12	26	53.3	
Procr			+ 3 010			+ 2 599	
A	+ 15	07	189	+ 12	29	532	
D	+ 13	46	50	+ 13	46	50	
S-D	+ 1	20	28.9	- 1	16	56.8	
tan(A-D)			+ 48297			- 4617.6	
log	3	68	392	3	66	441	
log	1	01	507	0	99	556	
tan S	9	43	17	9	34	57	
S	1	56	75	1	99	99	
tan	8	05	26	8	39	90	
tan	+ 10	35	31	- 9	89	82	
tan			+ 113			+ 251	
tan	3	23	649	1	21	269	
tan	3	23	346	1	20	849	
tan			- 200				

Times etc

Exp. test 1911 Nov 1 3^h 38^m - 3^h 50^m
 noon 3^h 44 21.0 - 3 44 21.5
 Clock slow 0 434

H. Sid T. 3 45 04 65
 H. Sid T. 4 44 31 05
 G. Sid T. 8 29 35 70
 Sid T. in house 14 54 23 72
 Interval 17 35 11 98
 Rec 2 52 87
 G. H. T. 17 32 19 11

From bank Alm

R. G.

Recd

noon 11^h 2^h 16^m 25^s 36 + 14^h 13^m 26^s 6
 Another 11^h 26 18 14 549
 32 3185 + 1 13 10 + 8 43.1
 Tubular place 2^h 17^m 38^s 46 + 14 21 29.7

Conson's parallel
 secondary

59^h 40 2
 16 17 0

MC 1397

1913 June 2

Center of Plate

x	y	R	a	D	$Decl$
82864	346072	2	11 04	+15	24 24
~~136868~~	~~127570~~		14 02	+12	39 51
241243	323346		19 35	+15	07 19
279794	120850		21 38	+12	39 53
47408	9178		66 19	15	36 27
1852	2294	2	16 35	+13	54 07
-18	-22		- 16	-	7 17
52	94	2	16 19	+13	46 50
31	465				
52	437				
156					
1612					

$$A = 2^h 16^m 19^s$$

$$D = +13^\circ 46' 50''$$

Preliminary - Plate constants

Rejecting stars =

$$\begin{aligned} 2-3 & -33.84 & -0.72 & +669 \\ +508 & -1170 = -662 & -6 & = -668 & = +1 \\ +441 & -1095 = -652 & -17 & = -669 & = 0 \\ -240 & 408 = -648 & -20 & = -670 & = -1 \\ 18.2681 & 766 & -13 & & = 18.2571 \end{aligned}$$

$$\begin{aligned} 4-7 & +34.82 & +0.62 & -561 \\ +252 & 7288 = +540 & +21 & = +561 & = 0 \\ -298 & 840 = +542 & +19 & = +561 & = 0 \\ -420 & 974 = +554 & +7 & = +561 & = 0 \\ 22.6768 & +636 & +14 & & = 22.6857 \end{aligned}$$

From Tables $b+a = -1.1$ $a = 0$ $a = -1.5$
 Observation -1.0 $+0.7$ -0.6

Times Etc.

Exp. station 1911 Nov 5	3 ^h 38 ^m	-3 ^h 50 ^m
moon	3 44	21.0 - 3 44 21.5 ^v
clock slow	0	43.4 ^v
H Sid. T.	3 45	04.65 ^v
A. Long	4 44	31.05 ^v
G Sid. T.	8 29	35.70 ^v
Sid. time moon	14 54	23.72 ^v
Interval	17 35	11.98 ^v
Red	2	52.87 ^v
G. M. T.	17 32	19.11 ^v

From Naut. Alman.	R. A.	Decl.
Moon 17 ^h	2 ^h 16 ^m	25° 36' + 14° 13' 26.6 ^v
Motion in ^m	2.26 18 ^v	14.949 ^v
32.3185 ^v	+ 1	13.10 ^v + 8 43.1 ^v
Tabular place	2 ^h 17 ^m	38° 46' + 14 21 24.7 ^v
Moon's parallax	59'	40.2 ^v
Semidiameter	16'	17.0 ^v

ME 1397

1913 June 2

Center of Plate

α	δ
8.2864	34.6072
~~13.6868~~	~~12.7570~~
24.1243	32.3346
<u>27.9794</u>	<u>12.0850</u>
4174.08	9178
18.52	2294
-18	-22
5.2	94
31	465
5.2	437
<u>15.6</u>	
16.12	

R	A	Decl
2	11 04	+15 24 24
	14 02	+12 34 51
	19 35	+15 07 19
	<u>21 38</u>	<u>+12 29 53</u>
	66 19	15 36 27
2	16 35	+13 54 17
	-16	-7 17
2	16 19	+13 46 50

$$A = 2^h 16^m 19^s$$

$$D = +13^\circ 46' 50''$$

Preliminary - Plate constants

Repeating star =

2-3 -3384	-0.72	+669
+508 -1170	-662 -5	-668 = +1
+441 -1095	-652 -17	-660 = 0
-240 = 408	-648 -20	-690 = -1
18.2681 = 766	-13	= 18 2571

-m +34.82	+0.62	-561
252 + 288	+540 + 21	+561 = 0
298 + 840	+542 + 19	+561 = 0
420 + 974	+554 + 7	+561 = 0
22.6768 + 636	+14	= 22.6857

Tables b+a:	-7.1	a = 0	a = -1.5
Observation	-1.0	+0.7	+0.6

Formation of Normals

	ab	an	bw
1	- 0.00	+ 0.0	- 76.6
2	+ 0.57	+ 29.4	+ 230.0
3	+ 2.16	+ 27.9	+ 37.7
4	+ 2.26	- 179.5	- 163.8
5	+ 1.36	+ 276.0	+ 92.6
6	- 0.00	- 59.5	+ 0.0
7	- 0.68	- 257.2	+ 39.4
9	- 2.16	+ 40.6	- 54.5
	+ 3.51	- 122.3	+ 104.8

$$[ac] = - + 0.29$$

$$- 10.63$$

$$[aa] = + 2 + 56 + 18.81$$

$$[bc] = - 6.03$$

$$[bb] = + 17.43$$

$$cn = 0.$$

pt.	pos. L	resid.
1	180.0	+ 7.0
2	187.3	- 8.2
3	216.6	- 2.2
4	227.6	+ 10.6
5	251.5	- 15.7
6	270.0	+ 6
7	278.7	+ 10.1
[8	308.5]	
9	323.4	- 2.8

MC 1397

1913 June 17

L6

Moon's Center.

	x	$x - x_0$	Δx	$(x - x_0)^2$	R^2	$0 - C$
1	18.2695	0.0000	-2	0.0000	4.5373	+36
2	18.0000	-0.2695	-2	0.0728	4.5228	-109
3	17.0000	-1.2695	-2	1.6122	4.5315	-22
4	16.6964	-1.5731	-2	2.4753	4.5451	+114
5	16.2542	-2.0153	-1	4.0618	4.5200	-137
6	16.1396	-2.1299	+0	4.5365	4.5365	+28
7	16.1620	-2.1075	+0	4.4415	4.5459	+122
8	16.6106	-1.6589	+1	2.7516	4.5024	reject
9	17.0000	-1.2695	+2	1.6112	4.5305	-32
Mean =					4.5337	0

	y	$y - y_0$	Δy	$(y - y_0)^2$
-1	20.5470	-2.1299	-2	4.5373
2	20.5676	-2.1093	-2	4.4500
3	20.9684	-1.7085	-1	2.9193
4	21.2383	-1.4386	-1	2.0698
5	22.0000	-0.6769	0	0.4582
6	22.6769	0.0000	0	0.0000
7	23.0000	+0.3231	0	0.1044
8	24.0000	+1.3231	+1	1.7508
9	24.3854	+1.7085	+1	2.9193

Approximate center.

$$x = 17.0 \quad y = 20.9684$$

$$\begin{array}{r} 243854 \\ 453538 \end{array}$$

$$\text{Mean } y = 22.6769$$

$$y = \text{min} = 20.5470$$

$$R = 2.1299$$

$$x = \text{min} = 16.1396$$

$$\text{Mean } x = 18.2695$$

$$\text{Center } \begin{cases} x_0 = 18.2695 \\ y_0 = 22.6769 \end{cases}$$

1161397

19135-17

66

Knowns Center

	x	$y - x$	Δx	$(x - \bar{x})^2$	R^2	$y - \bar{y}$
1	18.2695	00000 - 2	00000	4.5373	+36	
2	180000 - 0	2695 - 2	00728	4.5228	-109	
3	170000 - 1	2695 - 2	1.6122	4.5315	-22	
4	166964 - 1	5731 - 2	2.4753	4.5451	+114	
5	16.2542 - 2	0153 - 1	4.0618	4.5200	-137	
6	16.1396 - 2	1299 - 0	4.5365	4.5365	+28	
7	16.1620 - 2	1075 - 0	4.4415	4.5459	+122	
8	16.6106 - 1	6589 - 1	2.7516	4.5024	neg. val.	
9	170000 - 1	2695 + 2	1.6112	4.5305	-32	
			Mean	4.5337	0	

	y	$y - \bar{y}$	Δy	$(y - \bar{y})^2$
1	20.5470 - 2	1299 - 2	4.5373	
2	20.5676 - 2	1093 - 2	4.4500	
3	20.9684 - 1	7085 - 1	2.9193	
4	21.2383 - 1	4386 - 1	2.0698	
5	22.0000 - 0	6769 - 0	0.4582	
6	22.6769 - 0	0000 - 0	0.0000	
7	23.0000 + 0	3231 - 0	0.1044	
8	24.0000 + 1	3231 + 1	1.7508	
9	24.3854 + 1	7085 + 1	2.9193	

Approximate Center

$$x = 1.70 \quad y = 20.9684$$

$$24.3854$$

$$4.53538$$

$$\text{Mean } y = 22.6769$$

$$y = \text{min} = 20.5470$$

$$R = 2.1299$$

$$x = \text{min} = 16.1396$$

$$\text{Mean } x = 18.2695$$

$$\text{Center } \begin{cases} X = 18.2695 \\ Y = 22.6769 \end{cases}$$

1913 June 17. 27

MC 1397

Conditional Equations

	a	b	c	0		0-c
1	0.00	-2.13	+1	= +36	0 + 3 - 37 = -34	+70
2	-0.27	-2.11	+1	= -109	+ 7 + 3 - 37 = -27	-82
3	-1.27	-1.71	+1	= -22	+ 35 + 2 - 37 = 0	-22
4	-1.57	-1.49	+1	= +114	+ 43 + 2 - 37 = +8	+106
5	-2.02	-0.68	+1	= -137	+ 56 + 1 - 37 = +20	-157
6	-2.13	+0.00	+1	= +28	+ 59 - 0 - 37 = +22	+6
7	-2.11	+0.32	+1	= +122	+ 58 - 0 - 37 = +21	+101
8	-1.27	+1.71	+1	= -32	+ 35 - 2 - 37 = -4	-28
					+283-289	

Average = 71

Normal Equations

	a	b	c	
+	18.81	+ 3.51	- 10.63	= -122
+	3.51	+ 17.46	- 6.03	= +105
-	10.63	- 6.03	+ 8.00	= 0

$$\frac{\Delta a}{\Delta n} = +1.11$$

-	3.51	- 0.605	+ 1.985	= +23
+	10.63	+ 1.985	- 6.01	= -69

+	16.855	- 4.045	= +128
-	4.045	+ 1.99	= -69

$$\frac{\Delta c}{\Delta n} = +0.51$$

+	4.045	- 0.97	= +31
+		+ 1.02	= -38

$$c = -37$$

-	8.21	+ 4.04	= -140
+	8.64		= -12

$$b = -11$$

-	6.19	- 3.51	+ 4.65	= 0
-	30.80	- 17.46	+ 23.16	= 0

+	12.62	- 5.98	= -122
-	27.29	+ 17.13	= +105

-	9.54	+ 5.98	= +37
+	3.08	- 8.5	= -85

$$a = -28$$

1913 June 17 27

141397

Conditional Equations

	a	b	c	0		a	b	c	0		a	b	c	0
1	000	-21341	=	+36		0	+3	-37	=	-34		+70		
2	-027	-21111	=	-109		+7	+3	-37	=	-27		-82		
3	-127	-17111	=	-22		+35	+2	-37	=	0		-22		
4	-157	-14911	=	+114		+93	+2	-37	=	+8		+106		
5	-202	-06811	=	-137		+56	+1	-37	=	+20		-157		
6	-213	+00011	=	+28		+59	-0	-37	=	+22		+6		
7	-211	+03211	=	+122		+58	-0	-37	=	+21		+101		
8	-127	+17111	=	-32		+35	-2	-37	=	-4		-28		
														+253-289

Normal Equations

Average: 71

$$\begin{aligned}
 &+1881 + 351 - 1063 = -122 \\
 &+ 351 + 1746 - 603 = +105 \\
 &- 1063 - 603 + 8003 = 0
 \end{aligned}$$

$$\begin{aligned}
 &= 351 = 0605 + 1985 = +23 \\
 &+ 1063 + 1985 - 601 = -69
 \end{aligned}$$

$$\begin{aligned}
 &+ 1685 = 4045 + 128 \\
 &- 4045 + 199 = -69
 \end{aligned}$$

$$\begin{aligned}
 &+ 4045 = 097 + 31 \\
 &+ 102 = -38
 \end{aligned}$$

$$c = -37$$

$$\begin{aligned}
 &- 821 + 404 = -140 \\
 &+ 864 = -12
 \end{aligned}$$

$$b = -10$$

$$\begin{aligned}
 &= 619 = 351 + 465 = 0 \\
 &- 3080 = 1746 + 2316 = 0
 \end{aligned}$$

$$\begin{aligned}
 &+ 1262 = 598 = -122 \\
 &- 2729 + 1713 = +105
 \end{aligned}$$

$$\begin{aligned}
 &- 954 + 598 = +37 \\
 &+ 308 = -85
 \end{aligned}$$

$$a = -28$$

1913 July 2

28

196 1377

$$\begin{array}{r} X_0 = 18.2695 \\ - 14 \\ \hline 18.2681 \end{array}$$

$$\begin{array}{r} Y_0 = 22.6769 \\ - 1 \\ \hline 22.6768 \end{array}$$

Simplification Constant $X = 18.2571$ $Y = 22.6857$

$$\xi = +0.2571$$

$$\eta = +0.6857$$

$$\begin{array}{ll} \log \xi = & 9.41010 \\ \log S = & 9.98715 \\ \log w = & 8.50724 \end{array}$$

$$\begin{array}{ll} \log \tan S = & 9.3897 \\ \log \xi = & 8.8202 \\ \log \eta = & 5.2633 \end{array}$$

$$\log (X-A) = 0.91571$$

$$\begin{array}{ll} \log \eta_0 = & 9.83613 \\ \log w = & 7.33115 \end{array}$$

$$(X-A) + 08.24$$

$$(X-D) = 2.50498$$

$$A = 2^h 16 19$$

$$S = 0$$

$$+ 05 19.9$$

$$X_0 = 2^h 16 27.24$$

$$D = +13$$

$$46 50$$

$$Rea = +3.31$$

$$S_0 = +13^\circ 52' 09.4''$$

$$V = 2 16 30.55$$

$$Red = +21.9$$

$$S' = +13 52 31.8$$

1913 July 2

28

1916 13 97

$$Y_0 = 152695$$

$$\begin{array}{r} 152695 \\ - 14 \\ \hline 152681 \end{array}$$

$$Y_1 = 226769$$

$$\begin{array}{r} 226769 \\ - 1 \\ \hline 226768 \end{array}$$

Sunplate Constant

$$X = 182571 \quad Y = 226857$$

$$R = +02571$$

$$r = +06857$$

$$\log \rho = 9.91010$$

$$\log \tau = 9.98715$$

$$\log \eta = 8.50724$$

$$\log T_{\text{eff}} = 9.3897$$

$$\log \tau = 8.8202$$

$$\log \eta = 5.2633$$

$$(X-A) = 091571$$

$$\log \eta = 9.83613$$

$$\log \tau = 7.33115$$

$$X-A = +0829$$

$$(X-D) = 250448$$

$$A = 2^h 16^m 19^s$$

$$S-D = +05^m 19.9^s$$

$$X_0 = 2^h 16^m 27.24^s$$

$$D = +13^m 46.50^s$$

$$P_{\text{ra}} = +331$$

$$S_0 = +13^m 52.099^s$$

$$V = 2^h 16^m 30.55^s$$

$$P_{\text{la}} = +21.9$$

$$S = +13^m 52.318^s$$

1397

Red and brown light

 $S_0 = +13^{\circ} 52'$

$$H + \alpha \quad 5 \quad 15 = 78^{\circ} 45'$$

$$H \quad 2 \quad 59$$

$$\alpha \quad 2 \quad 16$$

$$G + G \quad 21 \quad 53$$

$$G + \alpha \quad 0 \quad 09 = 2^{\circ} 15'$$

$$L \cos S \quad 99872'$$

$$i \quad 07745'$$

$$(L) \quad 07637$$

$$L \cos (G + \alpha) \quad 99997$$

$$g \quad 11817$$

$$h \quad 85940$$

$$L \sin S \quad 93924$$

$$i \quad 88239$$

$$g' \quad 11814$$

$$g \quad 79920$$

$$f \quad +198$$

$$g \quad +0.01$$

$$h \quad +132$$

$$+331$$

$$L \sin S \quad 93796$$

$$\cos (H + \alpha) \quad 92902$$

$$h \quad 12912$$

$$L \sin \dots \quad 99916$$

$$g \cos S \quad 00128$$

$$i \quad 88239$$

$$h' \quad 99610$$

$$h \quad 01195$$

$$g \quad +1518$$

$$h \quad +0.091$$

$$i \quad +580$$

$$+2189$$

1 3 9 7

Lunar Parallax

 $\alpha' = 2$

16

30

55

 $\delta = +13^{\circ} 52' 31.8''$ $\theta = 3$

45

04

65

 $\alpha - \alpha' = +1$

28

34

1

 $\pi =$

59

40

2

 $=$

+22

08

32

''

+

8

35

+22

00

00

9.95727

0.00000

0.03283

9.99010

9.86913

8.23946

9.57623

0.01378

7.69860

 $\alpha - \alpha' = +17$

10

45

 $= +1$

08

70

 $\gamma = 44$

20

50

13

52

32

30

28

18

9.82640

8.23946

9.70510

0.15552

7.92648

 $S - S' = +29$

01

4

 $S = +14$

21

33

2

 $\alpha = 2$

17

39

25

Naut Alman $S = +14$

21

29

7

 $\alpha = 2$

17

38

46

 $\alpha - \alpha'$

+35

+079

Red Islander

-1.0

-0.15

 $\alpha - \alpha'$

+2.5

+0.64

1397

human Parallax

$$\alpha = 2^h 16^m 30^s.55$$

$$\delta = +13^\circ 52' 31.8''$$

$$\theta = 3 \quad 45 \quad 04.65$$

$$G - \alpha = +1 \quad 28 \quad 34.1$$

$$\pi = 59 \quad 40.2$$

$$+22^\circ 08' 32''$$

$$+ \quad \quad \quad 8 \quad 35$$

$$-22 \quad 00 \quad 00$$

$$995727$$

$$000000$$

$$003283$$

$$999010$$

$$\gamma = 44 \quad 20 \quad 50$$

$$13 \quad 52 \quad 32$$

$$30 \quad 28 \quad 18$$

$$982640$$

$$823946$$

$$970510$$

$$015552$$

$$792648$$

$$S - S' = +29 \quad 01.4$$

$$S = +14 \quad 21 \quad 33.2$$

$$\text{Nautilus } S = +14 \quad 21 \quad 29.7$$

$$O - C \quad \quad \quad +3.5$$

$$\text{Red Island } \quad \quad \quad -1.0$$

$$O - C \quad \quad \quad +2.5$$

$$986913$$

$$823946$$

$$957623$$

$$001378$$

$$769860$$

$$\alpha - \alpha' = +17 \quad 10.45$$

$$= +1^\circ 08' 70''$$

$$\alpha = 2 \quad 17 \quad 39.25$$

$$\alpha = 2 \quad 17 \quad 38.46$$

$$+0.79$$

$$-0.15$$

$$+0.64$$

