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XI

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Harvard Lunar Plates.

Measures and Reductions.

mary Fowler.

Volume XI.

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MC1093 1913 Mar 5 2

	1	2	3	4
x	11.1426	11.2408	20.1501	29.1831
3	11.2093	11.3779	20.2910	24.2158
x-3	-.667	-.1371	-.1409	-.327
y	27.7698	18.5722	17.9220	32.3170
m	27.5965	18.2004	17.8158	32.2379
y-m	+.1733	+.1718	+.1062	+.791

x-3	-75.74		+.2756
-.667	-.2088	=-.2755	=+1
-.1409	-.1348	=-.2757	=-1
-.329	-.2430	=-.2757	=-1
18.0107	-17.04		=18.1159

y-m	+72.8x		-1.74		-.2498
+.1733	+.811	=+.2544	-.47	=+.2497	=-1
+.1062	+.1467	=+.2529	-.30	=+.2499	=+1
+.791	+.1761	=+.2552	-.55	=+.2497	=-1
22.6539	+.1311		-.39		=22.5313

Tables a = +0.9 e = -0.2 a-e = +1.1 b+a = -0.9
Obs a = 0.0 e = +1.7 a-e = -1.7 b+a = +2.4

C-O	+0.9	-1.9	+2.8	-3.3

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MC1093 1913 mai 5. 2

	1	2	3	4
x	11.1426	11.2408	20.1501	24.1831
3	11.2093	11.3779	20. ~~2948~~ 2915	24.2158
x-3	+.667	-.1371	= ~~1147~~ - 1409	- .327
y	27.7698	18.3722	17.9220	32.3170
η	27.5965	18.2004	17.8158	32.2379
y-η	+.1733	+.1718	+.1062	+.0791

a-3	-.7524		+.2756
-.667	-.0858	-.2755	= +1
+.1409	-.1348	-.2757	= -1
+.0329	-.2430	-.2737	= -1
38.0107	-17.1709		= 18.1159

y-η	+72.8	-1.74		-.2498
+.1733	+.0811	+.2544 - .47	= +.2497	= -1
+.1062	+.1467	+.2529 - .30	= +.2499	= +1
+.0791	+.1761	+.2552 - .55	= +.2497	= -1
22.6539	+13.11	- .39		= 22.5313

Tables a: +0.9 b: -0.2 a-b: +1.1 b+a: -0.9
Ulm a: 0.0 b: +1.7 a-b: -1.7 b+a: +2.4

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MC1093. 1913 Jan. 7. 3.

Comparison Stars — measures.

	y d	y N	x d	x N
1	16188	15235	17601	16961
11.1	850400	129329	902634	155323
27.7	95	40	31	29
mg	00	45	12	76
5.8				
	27.7697	.7700	11.1419	.1432
2			15931	18499
11.2	14935	15061	83496	160909
18.4	11215	87818	48	98
mg	11	90	41	10
8.0	48	70		
	18.3726	.3717	11.2409	.2408
3	13867	17220	14760	18089
20.1	46477	164398	62719	165827
17.9	55	31	69	91
mg	75	32	76	99
7.5				
	17.9224	.9215	20.1499	.1503
4				
24.2	18331	16655	17688	17330
32.4	151666	98282	95262	154985
mg	60	27	20	96
8.2	39	61	97	35
	32.3171	.3168	24.1827	.1835

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MC 1093. 1913 Jan. 7.

Comparison Star – measures.

	a	N	d	N
1				
1.1	16188	15235	17601	16961
7.7	850400	129329	902634	155532
	95	40	31	29 31
5.8	00	45	12	76
	27.7697	.7700	11.1419	.1432
2				
			15931	18499
11.2	14935	15061	83496	160905
18.4	11215	87881	48	98
	11 15	90	41	10
5.8	48	70		
			11.2409	.2408
	18.3726	.3717		
3				
	13867	17220	14760	18089
10.1	46477 49	16439 38	62719	165827
17.9	55	81	69	91
	75	32	76	99
7.5				
	17.9224	.9215	20,1499	.1503
4				
4.7	18331	16655	17684	17350
32.4	151660 60	98286 26	95262 1	154985
	60	27	20	96
8.2	39	61	97	35
	32.3171	.3168	24.1827	.1835

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MC 1093.

1913 Jan 7.

Two-measures — Rescan reversed.

	d	N	d	N
1/				
17.0	17701	18467	17835	19110
20.9	87203 5-	17425-	16130 32	10815- 90
	21	1626	21	9-
	10	70	30	10
	20.8984	.8955	16.8294	.8310
2/				
16.8			16755	18180
21.0			7679 83	17258 54
			65	50
			61	89
			16.0916	.0927
3/				
16.1			12450	14419 06
22.0			12270 70	10
			61	14245-
			15.9817	.9833
4/				
16.0			11565- 58	13277
22.5-			56	13132 28
min			11440	34
in			16.0120	.0146
22				
5/				
16.0			16980	17859
23.0			11948 55	12890 90
			48	01
			85-	69
			16.4967	.4970
6/				
16.5-				
24.0				

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MC 1093 1913 Jan 7. 4

1/	a	N
17.0	17701	1.8467
20.9	87203.5	17425
	21	1626
	10	70
	20.8984	.8955

2/		
6.8	17835	19110
21.0	16130.32	10815.90
	21	91
	30	10
	16.8294	.8310

3/		
6.1	16755	18180
20	7679.85	17258.54
	65	50
	61	89
	16.0916	.0927

4/		
5.0	17450	14419.06
2.5	12270.70	10
	61	14245
	15.9817	.9833

5/		
4.0	11565.58	13277
3.0	56	13132.28
	11440	34
	16.0120	.0146

6/		
16.5	16980	17859
24.0	11948.55	17890.90
	48	01
	85	69
	16.4967	.4970

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MC1093. 1913 Jan. 7.

Moon's measures. Reseau reversed.

Z	d	N	d	N
17.0	15059	16874		
24.4	10961 54	11001 06		
	54	00		
	72	90		
	24410 8	.4118		
8	14998	15962		
18.0	81807 4	12800 90		
24.6	82	94		
4	08	72		
mean	24.6826	.6830		
9	scratch.	15000		
18.6	19975	11147 44	18122	15760
24.6	11821 16	43	13312 00	10585 60
	25	10	00	70
	80		18	65
	24.6157	.6141	18.5184	.5191

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Rec 1093. 1913 June 7.

unnecessaries

reversed.

	d		N	
17.0	15059		16879	
24.4	10961	54	11001	06
	54		00	
	72		90	

24410 8 .4118

	14998		15962	
8.0	81807	4	12800	90
24.6	82		94	
4	08		72	

24.6826 .6830

	scratch		15000			
18.6	17975		11147	49	18122	15960
24.6	11821	16	43		13312	10585 60
	25		10		00	70
	80				18	65

24.6157 .6141 18.5184 .5191

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Mc 1093 1913 Jan. 14. b

Times etc.

Exp to Stars	1911 May 6	$11^h\ 53^m$	$-12^h\ 02^m$	
" " moon		11 57 37.2	− 11 57 37.4	
clock fast		2 59.8		
H Sid T.		11 54 37.5		
" long.		4 44 31.05		
G Sid T.		16 39 08.55		
Sid T. to noon		2 52 53.96		
Interval		13 46 14.59		
Reduction		2 15.36		
G.M.T.		13 43 59.23	$\delta - \alpha = +1^h\ 22^m$	

From Ann Ephs.

moon 13^h	$10^h\ 30^m\ 40^s.21$	$+14^\circ\ 33'\ 49''.3$	
motion in 1^m 2.0709		13.371	
" " 43.9872	+ 1 31 09	− 9 45.5	
Tabular place	10 32 11 30	+14 24 03.8	

moon's parallax 57' 07".1

" semidiam. 15' 35.4

moon's age 8 ds

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MC 1093 1913 Jan. 14. 6

Times: etc.

Ref. t Stars	1911 May 6	11h 53m		-17° 02′
Hour		11 57	37.2	-11 57 37.4
clock fast		2	59.8	
Sid. T.		11 54	37.5	
Long		4	44	31 0.5
Sid T.		16	39	08.55
Sid T. to Noon		2	52	53.96
Interval		13	46	14.59
Reduction			2	15.36
G.M.T.		13	43	59.23

from Astr. Ephem.

Moon 13h		10h	30m	40.21	+14° 33′	49.3
Motion 1m	r 709			13.311		
43.987		+	1	31.09	- 9	45.5
Ephemeris		10	32	11.30	+14 24	03.8

Moons parallax 57′ 07.″1
Semidiam. 15′ 35.4

Moons augm. & ds.

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pt.	pos. ∠	resid.
1	210.0	-3
(2	215.6)	-
3	251.2	-9
4	270.0	+39
5	279.8	-2
6	311.6	-5-8
7	330.0	+6
8	0.0	+77
9	14.4	-50

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Mc 1093 1913 Mar 7

Provisional Center

	x	x − X₀	Δx	(x − X₀)²	(x−X₀)²+(y−Y₀)²	O − C
1	17.0000	−1.0111	− 2	1.0227	4.1111	+10
2	16.8302	−1.1809	− 2	1.3950	4.1317	reject
3	16.0922	−1.9189	− 1	3.6826	4.1107	+ 6
4	15.9825	−2.0286	0	4.1152	4.1152	+51
5	16.0133	−1.9978	+ 0	3.9912	4.1108	+ 7
6	16.4968	−1.5143	+ 1	2.2928	4.1042	−59
7	17.0000	−1.0111	+ 2	1.0219	4.1100	− 1
8	18.0000	−0.0111	+ 2	0.0001	4.1161	+60
9	18.5188	+0.5077	+ 2	0.2580	4.1031	−70
				mean	4.1101	+ 4

33

	y	y − Y₀	Δy	(y − Y₀)²
1	20.8970	−1.7572	− 2	3.0884
2	21.0000	−1.6542	− 1	2.7367
3	22.0000	−0.6542	− 1	0.4281
4	22.6542	0.0000	0	0.0000
5	23.0000	+0.3458	+ 0	0.1196
6	24.0000	+1.3458	+ 1	1.8114
7	24.4113	+1.7571	+ 2	3.0881
8	24.6828	+2.0286	+ 2	4.1160
9	24.6149	+1.9607	+ 2	3.8451

Approximate Center

x = 17.0 y: 20.8970
24.4113
45.3083

Mean y = 22.6542
y = max = 24.6828
R = 2.0286
x = min = 15.9825
X₀ = 18.0111

Center { X₀ = 18.0111
Y₀ = 22.6542

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MC 1993 1913 Jan. 7. 7

Observed Center.

	x	$x - X_0$	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O - C
1	17.0000	−1.0111	− 2	1.0227	4.1111	+ 10
2	16.8830	−1.1809	− 2	1.3950	4.1317	reject
3	16.0982	−1.9189	− 1	3.6826	4.1107	+ 6
4	15.9825	−2.0286	0	4.1152	4.1152	+ 51
5	16.0133	−1.9978	+ 0	3.9912	4.1108	+ 7
6	16.4964	−1.5143	+ 1	2.2928	4.1042	− 59
7	17.0000	−1.0111	+ 2	1.0219	4.1100	− 1
8	18.0000	−0.0111	+ 2	0.0001	4.1161	+ 60
9	18.5188	+0.5077	+ 2	0.2580	4.1031	+ 70
					mean 4.1101	± 4

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.8970	−1.7572	− 2	3.0884
2	21.0000	−1.6542	− 1	2.7367
3	22.0000	−0.6542	− 1	0.4281
4	22.6542	0.0000	0	0.0000
5	23.0000	+0.3458	+ 0	0.1196
6	24.0000	+1.3458	+ 1	1.8114
7	24.4113	+1.7571	+ 2	3.0861
8	24.6828	+2.0286	+ 2	4.1160
9	24.6149	+1.9607	+ 2	3.8451

Approximate Center

x = 17.0 y: 20.8970
24.4113
45.3083
mean y = 22.6542
y: max = 24.6828
R = 2.0286
x: min = 15.9825
X_0 = 18.0111

Center $\begin{cases} X_0 = 18.0111 \\ Y_0 = 22.6542 \end{cases}$

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Formation of Normals

No		ab		aw		bw
1	+	1.78	−	10.1	−	17.6
3	+	1.25	−	11.5	−	3.9
4	−	0.00	−	103.5	+	0.0
5	−	0.70	−	14.0	+	2.4
6	−	2.09	+	89.0	−	79.6
7	−	1.78	+	1.0	−	1.8
8	−	0.02	−	0.6	+	122.0
9	+	1.00	−	35.6	−	137.2
	−	0.51	−	85.3	−	115.7

[aa] = +16.38 [bb] = +16.50

[ac] = − 8.98 [bc] = + 5.04 [cw] = +4

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MC1093 1913 May 7. 8

moon's Center.

Conditional Equations.

	a	b	c	O		C	O - C
1	−101	−176	+1	= +10	+ 84	10 − 5 = +13	− 3
3	−192	−0.65	+1	= + 6	+ 16	+ 4 − 5 = +15	− 9
4	−203	+0.00	+1	= +51	+ 17	− 0 − 5 = +12	+39
5	−200	+035	+1	= + 7	+ 16	− 2 − 5 = + 9	− 2
6	−151	+135	+1	= −59	+ 12	− 8 − 5 = − 1	−58
7	−101	+176	+1	= − 1	+ 8	− 10 − 5 = − 7	+ 6
8	−001	+203	+1	= +60	+ 0	− 17 − 5 = − 17	+77
9	+051	+196	+1	= −70	− 4	− 11 − 5 = −20	−50
						+172 −172	

Average (O-C) = 30

Normal Equations

$$+16.38 - 0.51 - 8.98 = -85 \qquad \frac{\Delta x}{\Delta n} = +1.09$$
$$-0.51 + 16.50 + 5.04 = -116$$
$$-8.98 + 5.04 + 8.00 = +4$$

$$+0.51 - 0.02 - 0.28 = -3$$
$$+8.98 - 0.28 - 4.95 = -47$$

$$+16.48 + 4.76 = -119 \qquad \frac{\Delta y}{\Delta n} = -0.59$$
$$+4.76 + 3.05 = -43$$

$$-4.76 - 1.38 = +34$$
$$+1.67 = -9 \qquad c = -5+$$

$$-7.44 - 4.76 = +67$$
$$+9.04 = -52 \qquad b = -6$$

$$-0.91 + 0.51 + 0.81 = +0$$
$$+29.46 - 16.50 - 26.20 = -13$$

$$+15.47 - 8.17 = -85$$
$$+28.96 - 21.16 = -129$$

$$-11.20 + 8.17 = +50$$
$$+4.27 = -35 \qquad a = -8$$

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M2095 1913 Mar. 7. 8

Conditional Equations.

	a	b	c	O	C	O − C
1	−1.01	−1.76	+1	= +10	+ 84	10 − 5 = +13	− 3
3	−1.92	−0.65	+1	= + 6	+ 16	+ 4 − 5 = +15	− 9
4	−2.03	+0.00	+1	= +51	+ 17	− 0 − 5 = +12	+ 39
5	−2.00	+0.35	+1	= + 7	+ 16	− 2 − 5 = + 9	− 2
6	−1.51	+1.35	+1	= −59	+ 12	− 8 − 5 = − 1	− 58
7	−1.01	+1.76	+1	= − 1	+ 8	− 10 − 5 = − 7	+ 6
8	−0.01	+2.03	+1	= +60	+ 0	− 12 − 5 = − 17	+ 77
9	+0.51	+1.96	+1	= −70	− 4	− 11 − 5 = −20	− 50
						+172 −172	

Normal Equations. Average (O−C) = 30

$$+16.38 - 0.51 - 8.98 = -85$$
$$-0.51 + 16.50 + 5.04 = -116$$
$$-8.98 + 5.04 + 8.00 = +4$$

$$+0.51 - 0.02 - 0.28 = -3$$
$$+8.98 - 0.28 - 9.95 = -47$$

$$+16.48 + 4.76 = -119$$
$$+1.76 + 3.05 = -43$$

$$-4.76 - 1.38 = +34$$
$$+1.67 = -9. \qquad c = -5+$$

$$-7.44 - 4.76 = +67$$
$$+9.04 = -52 \qquad b = -6$$

$$-0.91 + 0.51 + 0.81 = +0$$
$$+29.46 - 16.50 - 26.20 = -13$$

$$+15.47 - 8.17 = -85$$
$$+28.96 - 21.16 = -129$$

$$-11.20 + 8.17 = +50$$
$$+4.27 = -35 \qquad a = -8$$

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1093

Moon's Mean Position (1911.0)

$X_0 = 18.0111$ ✓
$\frac{1}{2}a = -\ 4$ ✓
18.0107 ✓

$Y_0 = 22.6542$ ✓
$\frac{1}{2}b = -\ 3$ ✓
22.6539 ✓

From Plate Constants $X = 18.1159$ ✓ $Y = 22.5313$ ✓

$\xi = +0.1159$ ✓
$\log \xi = 9.064084$ ✓
$\therefore \log \sin \delta \quad 9.998702$
$\therefore \text{const.} \quad 8.507724$
$(\kappa - A) \quad 0.569826$ ✓

$\eta = +0.5313$ ✓
$\log \tan S = \quad 9.39968$
$\therefore S^2 \quad 8.12822$
$\therefore \eta_1 \quad 4.57784$

$\log \eta_0 = \quad 9.725534$ ✓
$\therefore \text{const.} \quad 7.331155$ ✓
$\therefore (\delta - D) = \quad 2.394189$ ✓

$\kappa - A = +\ 3.71$ ✓

$A = 10\ 31\ 05$ ✓

$\alpha_0 = 10\ 31\ 08.71$ ✓

$\text{Red.} = +\ 0.90$ ✓

$\alpha = 10\ 31\ 09.61$

$\delta - D = +\ 4\ 07.8$ ✓

$D = +13\ 52\ 15$ ✓

$\delta_0 = +13\ 56\ 22.8$ ✓

$\text{Red.} = -\ 0.4$ ✓

$\delta = +13\ 56\ 22.4$ ✓

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1093

Moonslucan Position (1911.0)

$X_0 = 18.0111 - 4 = 18.0107$ $\quad$ $Y_0 = 22.6542 - 3 = 22.6539$

From Plate constants $X = 18.1159$ $\quad$ $Y = 22.5313$

$\xi = +0.1159$
$\log \xi = 9.06408$
$\log S = 9.98702$
$\omega = 8.05124$

$(\delta - A) \quad 0.56962$

$\delta - A \quad + \quad 3.71$

$A_0 \quad 10 \; 31 \; 05$

$\alpha_0 \quad 10 \; 31 \; 08.71$

Red. $\quad + 0.90$

$\alpha \quad 10 \; 31 \; 09.61$

$\eta = +0.5313$
$\log \tan S = 9.39668$
$S = 8.1282$
$\eta' \quad 9.5784$

$\log \eta_0 = 9.72534$
$\omega = 7.33115$

$(\delta - D) \quad 2.39419$

$\delta - D = + 9.078$

$D = +13 \; 52 \; 15''$

$\delta_0 = +13 \; 56 \; 22.8$
Red. $\quad - 0.4$
$\delta = +13 \; 56 \; 22.4$

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1093 Red ad locum alph.

H+α	1ʰ	19ᵐ	= 19° 45′
H	14	48	
α	10	31	
G	19	09	
G+α	5	40	= 85°

l cos(G+α)	8.9403
q	0.8721
sin ..	9.9983
tan δ	9.3946
	8.8239
(i′)	98124
(δ)	90889
δ	

δ₀	+ 13° 56′
l cos δ	9.9870
i	0.7567 −
(i)	0.7437 −
l sin δ	9.3816
cos(H+α)	9.9737
h	1.2929
sin ..	9.5288
cos δ	0.0130
	8.8239
(h′)	06482
(h)	96586

f	+032
δ	+0.12
h	+046
	+090

δ′	+0.65
h	+4.45
i	−5.54
	−0.44 ✓

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1093 Red. ecl. heavens apln.

H+α	1	19	= 19° 45′
H	14	48	
α	10	31	
G	19	09	
G+α	5	40	= 85°

δ_0 +13° 56′

l cos δ	9.9870
i	0.7567 −
(i)	0.7437 −

l cos(G+α)	8.9403
g	0.8721
sin	9.9963
tan δ	9.5946
	8.8239

(δ′)	9.8124
(δ)	9.0889

l sin δ	9.3816
cos(H+α)	9.9737
h	1.2929
sin	9.5288
cos δ	0.0130
	8.8239

(h′)	0.6482
(h)	9.6586

f	+0.32
g	+0.12
h	+0.46
	+0.90

δ′	+0.65
h′	+4.45
i	−5.59
	−0.49

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1093 Lunar Parallax.

$\alpha' = 10^h\ 31^m\ 09^s.61$ ✓

$\Theta = 11\ 54\ 37.5$ ✓

$+ 1\ 23\ 27.9$ ✓

$+ 20^\circ\ 52'\ 00''$ ✓

$+ \quad 7\ 46$ ✓

$+20\ 44\ 14$ ✓

9.995727 ✓
0.000000
0.002909 ✓
9.998636 ✓

$\phi = 44\ 06\ 02$ ✓

$13\ 56\ 22$ ✓

$30\ 09\ 40$ ✓

9.826400 ✓
8.220488 ✓
9.701085 ✓
0.157455 ✓
7.905411 ✓

$\delta - \delta' = +27\ 39.0$ ✓

$\delta = +14\ 24\ 01.4$ ✓

Hart Allen $\delta = +14\ 24\ 03.8$ ✓

O − C -24

Cor. to Hand reading -10 ✓

O − C -34 ✓

$\delta' = +13^\circ\ 56'\ 22''.4$ ✓

$\pi = 57'\ 07''.1$ ✓

9.869137 ✓
8.220488 ✓
9.955169 ✓
0.013786 ✓
7.655516 ✓

$\alpha - \alpha' = +1^\circ\ 32'\ 36''.6$ ✓

$= +1^m\ 02^s.16$ ✓

$\alpha = 10\ 32\ 11.77$ ✓

$\alpha = 10\ 32\ 11.30$ ✓

$+0.47$ ✓

$+0.14$ ✓

$+0.61$ ✓

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1093 Lunar Parallax.

$\alpha' = 10^h\ 31^m\ 09.^s61$
$\odot - 11\ 54\ 37.5$
$+ 1\ 23\ 27.9$
$+ 20^\circ\ 52'\ 00''$

$+ \quad 7\ 46$

$+ 20\ 44\ 14$

9.995727
0.000000
0.002909
9.998636

$\delta' = 49\ 06\ 02$

$13\ 56\ 22$

$30\ 09\ 40$

9.826400
8.220488
9.701108
0.015745
7.905541

$\delta' = +13^\circ\ 56'\ 22.''4$

$\pi = 57'\ 07.''1$

9.569913
8.220488
9.955149
0.013786
7.655516

$\alpha - \alpha' = +1^m\ 32.^s36$
$= +1^m\ 02.^s16$

$\delta - \delta' = +27\ 39.0$

$\delta = +14\ 24\ 01.4$

Rectified $\delta = +14\ 24\ 03.8$

O − C -2.4

Corr. to land reading -1.9

O − C -3.4

$\alpha = 10\ 32\ 11.77$

$\alpha = 10\ 32\ 11.30$

$+0.47$

$+0.14$

$+0.61$

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Comp. Stars - Standard Coordinates

No.	1438 mag. 5.8	No. 1439 mag 8.0
α	10h 26m 51.54	10h 26m 58.15
	52	17
	54	15
mean	10 26 51.53	10 26 58.16
Prec	+ 35.26	+ 35.17
α	10 27 26.79	10 27 33.33
A	10 31 57	10 31 57
α−A	− 4 30.21	− 4 23.67
sin(α−A)	− 270.19	− 263.65
log	2.43167n	2.42103n
cos δ	9.98575	9.98805
" ξ_0	0.92246n	0.91632n
ξ_0	− 8.4074	~~− 8.2485~~ − 8.2474
ξ_1	− 20	~~− 18~~ − 18
ξ	9.5906	~~9.7627~~ 9.7508
x	9.6018	~~9.6508~~ 9.6508
x − ξ	+ 112	~~− 1189~~ − .1000
δ	+ 14 39 02.1	+ 13° 25′ 59.8″
	02.0	26 00.2
	01.4	25 59.0
mean	+ 14 39 01.8	+ 13 25 59.7
Prec	− 3 22.4	− 3 22.7
δ	+ 14 35 39.4	+ 13 22 37.0
D	+ 13 56 12	+ 13 56 12
δ − D	+ 39 27.4	− 33 35.0
sin(δ−D)	+ 2367.5	− 2015.1
log	3.37429	3.30430n
η_0	0.70544	0.63545n
tan δ	9.4156	9.3762
ξ^2	1.8493	1.8326
η_1	8.3183	8.2622
η_0	+ 5.0750	− 4.3197
η_1	+ 208	+ 183
η	27.0958	17.6986
y	27.1682	17.7685
y − η	+ 724	+ ~~70~~ 699

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MC 1094 1913 Jan 20.6 17

Comp. Stars — Standard coords.

3

No.	14 56	mag.	8.0
C	10h 35m 19.90		
L		95	
		94	
mean	10 35 19.93		
Rec	+ 34.98		
	10 35 54.91		
A	10 31 57		
-A	+ 3 57.91		
(α-A)	4 23 7.90		
log	2.37639		
cos δ	9.98957		
	0.87314		
	+ 7.4668		
	+ 30		
	25.4698		
	25.4728		
	- 17.38		
	+12° 36' 01.0		
	00.0		
	59.9		
mean	12 36 00.3		
Rec	- 3 27.7		
	+12 32 34.6		
	+13 56 12		
-D	- 1 23 37.4		
(δ-D)	- 50 16.4 m		
	3.70057 m		
	1.03172 m		
tan δ	9.34773		
δ²	17463		
m₁	8.1470		
m₀	- 10.7572		
m₁	+ 140		
m	11.2568		
m	11.1360		
1-m	- .1208		

4

mag.	14 53	mag.	8.7
	10h 33 50.02		
	98		
	98		
	10 33 49.99		
	+ 35.76		
	10 34 25.75		
	10 31 57		
	+ 2 28.75		
	+ 148.75		
	2 17.10		
	9.98454		
	0.66274		
	+ 4.5998		
	+ 14		
	22.6012		
	22.6708		
	+ 696		
	+ 15 15 10.5		
	10.2		
	9.1		
	15 15 09.9		
	- 3 25.7		
	15 11 44.7		
	13 56 12		
	+ 1 15 32.7		
	+ 45.34		
	3.65643		
	0.98758		
	9.43340		
	.13255		
	78129		
	+ 19.7180		
	+ 65		
	31.7245		
	31.6437		
	- 808		

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MC 1094 1913 Jan 9.-10. 18.

Comp Stars – measures Reseau reversed in plate

	y		x	
1	a	N	a	N
9.6	18114	18675	16790	16912
27.1	16431 34	10355 55	12802 08	10885 87
avg	34	57	01	79
58	10	70	92	05
	27.1680	.1684	9.6013	.6024
2				
9.7	16205	16055	16920	16048
17.8	8518 14	13742 38	13430 29	9541 35
avg	15	37	27	36
58	00	50	27	44
	17.7685	.7685	9.6507	.6508
3	very faint.			
18.6	15395			
17.3	12686			
avg	77			
7.5				
4				
22.7	14613	14509	15150	15225
31.7	8177 78	10940 44	11860 63	8515 16
avg	73	47	55	16
58	16	08	52	25
82				
	31.6439	.6435	22.6708	.6709
5	14760	14710	12903	15919
25.2	13401 00	6070 69	5860 57	12958 55
11.11	98	68	60	57
	51	08	00	21
	11.1359	.1361	25.2958	.2962

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MC1094. 1913 Jan 9.
Jan 10.

Moon – measures.

Reseau reversed on plate

	d	N	d	N
1				
16.0	17999	13500		
19.8	95-89.75	11848.70		
	80	79		
	95-	00		
	19.8419	.8366		
2				
15.7			17690	17478
20.0			15190.00	9959.74
			00	74
			90	80
			15.7507	.7511
3				
15.1			15605	16538
21.0			6298.00	15830.36
			06	32
			16	40
			15.0686	.0705
4				
15.0			12100	12790
21.5			11853.40	8189
			50	12045
			14.9748	.9758
5				
15.0			11201.05	11063
22.0			12	10920.21
			10081	13
			15.0125	.0125
6				
15.6			18651	15916
23.0			14029.47	10520.37
			25	30
			64	23
			15.5377	.5291

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MC 1094 1913 Jan. 10. 2.0

Neon-lines Reseau reversed on plate

Z	d	N	d	N
16.0	16896	18570		
23.4	13300 98	12173 65		
	98	62		
	98	68		
	23.3598	.3598		
Z				
17.0	15858	17613		
23.6	9565 60	13880 79		
max	48	81		
in	32	15		
y				
	23.6276	.6266		
9	Scratch			
17.4				
23.5	15819	17627	15489	16758
	9915 20	13498 00	9486 90	12748 40
	30	91	88	38
	19	24	87	60
	23.5897	.5870	17.4000	.4017

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MC1094 1913 Jan 14. 21

Times etc.

Exp to stars 1911 May 6	12h	06			-12	15		
" " moon	12	10	44.7ᵛ		-12	10	44.9ᵛ	
Clock fast		2	59.8ᵛ					
H. Sid T.	12	07	450ᵛ					
H Long.	4	44	31.05ᵛ					
G. Sid T.	16	52	16.05ᵛ					
Sid T. in Moon	2	52	53.96ᵛ					
Interval	13	59	27.09ᵛ					
Reduction		2	17.51ᵛ					
G. M. T.	13	57	04.588ᵛ					

$G - \lambda + 1^h 35^m$

From Conn Eph.

Moon 14h	10h	32m	44s41ᵛ		+14°	20′	30″.1ᵛ	
Motion in 1m	2.0677ᵛ							
" " -2.9237ᵛ								
			6.04ᵛ	13.34bᵛ			39.0ᵛ	
Tabular place	10h	32m	38.37ᵛ		+14°	21′	09.1ᵛ	

Moon's parallax 57′ 06.7ᵛ

" semidiam. 15 35.3ᵛ

Age of moon 8

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MC1094 1913 mar. 6 22

Center of Plate stet.

x	y	R.a.	Decl.
9.6018	27.1682	10 27 27	+14 35 39
9.6508	17.7685	27 33	+13 22 37
25.2960	11.1360	35 55	+12 32 35
22.6708	31.6437	34 25	+15 11 45
1.6722	87.72	125 20	15 48 36
16.80	21.93	10 31 20	+13 55 39
-18	-22	+ 37	+ 33
1.20	.07	10 31 57	+13 56 12
31	465		
3.7.2	32.55		

Using Stars 2, 3, 4, Hor. 1439, 1453, 1456

x - 3 = -119.14		-332	+3148
-1000 - 2096	= -3096	-32 = -3148	= 0
-1758 - 1326	= -3084	-83 = -3147	= +1
+696 - 3769	= -3073	-75 = -3148	= 0
17.0041 - 25.72		-56	= 17.0561

y-y + 120.1x		-4.24	-1783
+699 + 1159	= +1858	-75 = +1783	= 0
-1208 + 3038	= +1830	-47 = +1783	= 0
-808 + 2723	= +1915	-133 = +1782	= -1
21.5988 + 20.42		-91	= 21.6156

tables.	a = +0.9	e = -0.3	a - e = +1.2	b + a = -1.2
Obs.	a = +3.3	e = +4.2	a - e = -0.9	b + a = -1.0

c - o	-2.4	-4.5	+2.1	-0.2

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NGC 1094 1913 Jan. 7. 23

Moore's Center.

	x	(x − X₀)	Δx	(x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	160000	−1.0030	−2	1.0064	4.1058	− 57
2	15.7509	−1.2521	−2	1.5682	4.1266	+ 151
3	150696	−1.9334	−1	3.7384	4.0977	− 138
4	149753	−2.0277	0	4.1116	4.1116	+ 1
5	15.0125	−1.9905	+1	3.9617	4.1222	+ 107
6	15.5384	−1.4646	+2	2.1445	4.0065	− 50
7	16.0000	−1.0030	+2	1.0056	4.1050	− 65
8	17.0000	−0.0030	+3	0.0000	4.1174	+ 9
9	17.4008	+0.3978	+3	0.1585	4.1154	+ 39
				Mean	4.1115	−3
						69

	y	(y − Y₀)	Δy	(y − Y₀)²
1	198390	−1.7604	−1	3.0994
2	20.0000	−1.5994	−1	2.5584
3	21.0000	−0.5994	−0	0.3593
4	21.5994	0.0000	0	0.0000
5	22.0000	+0.4006	+0	0.1605
6	23.0000	+1.4006	+1	1.9620
7	23.3598	+1.7604	+1	3.0994
8	23.6271	+2.0277	+2	4.1124
9	23.5884	+1.9890	+2	3.9569

Approximate Center

x = 16.0 y = 19.8390
23.5598
43.1988

Mean y = 21.5994
y − mean = 2.0277
R = 2.0277
x − min = 14.9753
X₀ = 17.0030

Center { X₀ = 17.0630
Y₀ = 21.5994

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MC 1094 1913 Apr. 26

Moons Centre.

Conditional Equations

	a	b	O	c	O − C
1	− 1.00	− 1.76	+ 1 = − 57	− 23 + 22 + 31 = + 30	− 87
2	− 1.75	− 1.60	+ 1 = + 151	− 29 + 20 + 31 = + 22	+ 129
3	− 1.93	− 0.60	+ 1 = − 138	− 44 + 7 + 31 = − 6	− 132
4	− 2.03	+ 0.00	+ 1 = + 1	− 47 − 0 + 31 = + 16	+ 17
5	− 1.99	+ 0.40	+ 1 = + 107	− 46 − 5 + 31 = − 20	+ 127
6	− 1.46	+ 1.40	+ 1 = − 50	− 34 − 17 + 31 = − 20	− 30
7	− 1.00	+ 1.76	+ 1 = − 65	− 23 − 22 + 31 = − 14	− 51
8	− 0.00	+ 2.03	+ 1 = + 9	− 0 − 25 + 31 = + 6	+ 3
9	+ 0.40	+ 1.99	+ 1 = + 39	+ 9 − 25 + 31 = + 15	+ 24

+ 300 − 300

Average (O − C) = 67

Normal Equations

$$\frac{\Delta x}{\Delta z} = +$$

+ 17.69 + 1.10 − 10.28 = + 74
+ 1.10 + 19.31 + 3.62 = − 104
− 10.28 + 3.62 + 9.00 = − 3

− 1.10 − 0.07 + 0.64 = − 5
+ 10.28 + 0.64 − 5.98 = + 43

+ 19.24 + 4.26 = − 109
+ 4.26 + 3.02 = + 40

$$\frac{\Delta y}{\Delta z} = - 0.45$$

− 4.26 − 0.94 = + 24
+ 2.075 = + 64

c = + 31

− 6.01 − 4.26 = − 55
+ 13.23 = − 164

b = − 12

+ 3.12 − 1.10 − 2.74 = + 1
+ 54.83 − 19.31 − 48.00 = + 16

+ 20.81 − 13.02 = + 75
+ 55.93 − 44.38 = − 88

− 16.48 + 13.02 = + 26
+ 4.40 = + 101

a = + 23 −

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1094

Moore's Ocean Position (1911.0)

$X_0 = 17.0030$ ✓ $\quad Y_0 = 21.5994$ ✓

$\frac{1}{2}a = +11$ ✓ $\quad \frac{1}{2}b = -6$ ✓

17.0041 ✓ $\quad 21.5988$ ✓

From Plate Constants $X = 17.0561$ ✓ $\quad Y_1 = 21.6156$ ✓

$\xi = -0.9439$ ✓

$\log \xi = 9.974933$ ✓

$\therefore \text{abs } \delta \quad 9.987111$ ✓

$\therefore \text{arc } \delta \quad 8.507724$

$\therefore (\alpha - A) \quad 1.480568$ ✓

$\alpha - A = -30.24$ ✓

$A \quad 10\ 31\ 57$ ✓

$\alpha_0 \quad 10\ 31\ 26.76$ ✓

$\text{Red.} = +0.90$ ✓

$\alpha = 10\ 31\ 2766$ ✓

$\eta = -0.3844$ ✓

$\log \text{arc } \delta = 9.3930$ ✓

$\therefore \xi^2 = 9.9499$ ✓

$\therefore \eta_1 = 6.3963$ ✓

$\eta_1 = +2$ ✓

$\eta_0 = -0.3846$ ✓

$\log \eta_0 = 9.585011$ ✓

$\therefore \text{arc } \delta = 7.331115$

$\therefore (\delta - D) = 225386$ ✓

$\delta - D = -259.4$ ✓

$D = +13\ 56\ 12$ ✓

$\delta_0 = +13\ 53\ 126$ ✓

$\text{Red} = -0.4$ ✓

$\delta = +13\ 53\ 122$ ✓

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1094 Lunar Parallax.

$\alpha' = 10^h\ 31^m\ 27.66^s$
$\Theta = 12\ 07\ 45.0$
$\Theta - \alpha' = +1\ 36\ 17.34$ ×
$= +24^\circ\ 04'\ 20''$

$+\quad 8\ 54$

$+23\ 55\ 26$

9.995727
0.000000
0.003902
9.999629

$\gamma = 44\ 45\ 20$

$13\ 53\ 12$

$30\ 52\ 08$

9.826400
8.220430
9.710188
0.152388
7.909390

$\delta - \delta' = +27\ 54.2$

$\delta = +14\ 21\ 064$

Hart Obs. $\delta = +14\ 21\ 091$

O − C -2.7

Corr to Land. radius -0.6

O − C -3.3

$\delta' = +13^\circ\ 53'\ 12''$

$\Pi = 57'\ 06''.7$

9.869133
8.220430
9.610547
0.013777
7.713887

$\alpha - \alpha' = +17'\ 47''.325$
$= +1^m\ 11^s.16$

$\alpha = 10\ 32\ 38.82$

$\alpha = 10\ 32\ 38.37$

$+0.45$

$+0.11$

$+0.54$

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MC1123 1913 Feb 28. 32

Preliminary Reduction.

	1	2	3	4
x	35966	80790	20.8346	306521
y	3.6637	8.0572	21.0334	50.6773
x − y	−2671	+218	−1988	−252
q	89264	310622	143060	27.2490
η	8.7028	30.8969	14.3170	27.3884
q − η	+2236	+1653	−110	−1394

x − y	−1314		+3844
−2671	−1169	= −3840	= +4
+218	−4069	= −3851	= −7
−1988	−1874	= −3862	= −18
−252	−3570	= −3822	= +22
17.5369	−2820		= 17.6393

q − η	+1355.5x		−1.54		−2706
+2236	+489	= +2725	−13	= +2712	= +6
+1653	+1095	= +2748	−47	= +2701	= −5
−110	+2823	= +2713	−21	= +2692	= −14
−1394	+4153	= +2759	−41	= +2718	= +12
21.5311	+2376		−32		= 21.4949

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MC1123

1913 Feb. 28.

3.2

Preliminary Reduction.

	1	2	3	4
x	35966	80790	20.8546	306521
s	3.8639	8.0572	21.0334	30.6773
x - s	- 2671	+ 218	- 1988	- 252
y	89264	31.0622	14.3060	27.2490
η	8.7028	30.8969	14.3170	27.3884
y - η	+ 2236	+ 1653	- 110	- 1394

x - s	- 1314		+ 3844
- 2671	- 1169	= - 3840	= + 4
+ 218	- 4069	= - 3851	= - 7
- 1988	- 1874	= - 3862	= - 18
- 252	- 3570	= - 3822	= + 22
17.5369	- 2820		= 17.6393

y - η	+ 1555 x		- 1.54		- 2706
+ 2236	+ 489	= + 2725	- 13	= + 2712	= + 6
+ 1653	+ 1095	= + 2748	- 47	= + 2701	= - 5
- 110	+ 2823	= + 2713	- 21	= + 2692	= + 14
- 1394	+ 4153	= + 2759	- 41	= + 2718	= + 12
21.5311	+ 2376		- 32		= 21.4949

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MC1123. 1913 Jan. 13. 33

Comparison Stars - measures.

	α	N	α	N
1/	83 01 98	12519	18200	18306
3.6	60	11785 84	14160 60	12339 35
8.9	7562	83	60	36
mg.			00	11
4.6				
	8.9262	.9265	3.5960	.5972
2				
80	14924	18048	15895	18545
31.0	14298 99	86 53 58	6686 91	17754 47
mg.	96	59	96	51
7.3	24	40	06	48
	31.0626	.0617	8.0786	.0794
3				
20.9	17421	14830	16811	15592
14.3	14365 61	7890 92	15156 49	7233 37
mg	65	93	51	40
5.8	24	31	15	88
	14.3058	.3063	20.8340	.8352
4				16605
30.6	17838	18269	17827	10090 95
17.3	15339 48	10760 59	14353 54	90
mg	44	59	58	05
8.7	32	71	31	
	272493	.2488	30.6527	.6513

Remeasure (A)

α	N
17309	17140
13830	10640 40
27	41
01	63
30.6528	6522

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MC1123

1913 Jan. 13.

Moon-Measures.

4

	d		N	
4				
16.8				
20.0				
	15518		15750	
	769704		13555	55
	91		57	
	.21		50	
	16.2177		.2194	
2				
16.0	19050		15260	
20.3	16850	51	7436	54
	57		50	
	60		61	
	20.2199.		.2186	
3				
15.6				
21.0				
	18100		15028	
	13959	62	9148	40
	51		37	
	94		29	
	15.5859		.5887	
4				
15.5				
21.5				
min				
in				
x				
	17060		18020	
	12214	00	12865	60
	10		60	
	62		21	
	15.5147		.5159	
5				
15.6				
22.0				
	17026		18038	
	12711	03	12379	72
	91		66	
	40		50	
	15.5670		.5672	
6				
16.0	16599		16049	
22.8	8150	46	14479	82
	57		90	
	97		53	
	22.8446		.8434	

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15518	15706
7697 04	13555 55
91	57
21	50
16.7177	.2194

19050	15760
16859 51	7436 54
57	50
60	61
20.2199	.3186

18100	15028
13959 62	9142 40
51	37
94	29
15.5854	.5887

17060	18020
12714 00	12865 60
10	60
62	21
15.5147	.5151

17026	18038
12711 03	17379 72
91	26
40	50
15.5670	.5672

16599	16049
8150 46	14479 82
57	40
97	53
22.8446	.8434

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MC1123. 1913 Jan 13 35

Moon - Measures.

	4			2c	
Z	a	N	a	N	
16.1			16117	15526	
23.0			75888 08	14060 50	
			98	45	
			10	16	
			16.1482	.1473	

8		
17.0	15773	15278
23.4	109977 98	10053 61
	84	61
	79	76
	23.4783	.4781

9		
17.5	14750	14306
23.5	92150 09	98440 43
	09	45
	56	13
	23.5542	.5534

10		
18.0	13726	14340
23.5	87732 39	93171 15
	36	95
	29	42
	23.4991	.4971

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MC1123 1913 Jan. 16. 36

Times etc.

Eph. ☆ Stars	1911 June 3	14ʰ	23ᵐ			-14ʰ	37ᵐ	
" Moon		14	27	04.8ˢ	- 14	27	05.0	"
Clock fast			3	13.1				
H Sid T.		14	23	51.8				
H Long.		4	44	31.05				
G Sid T.		19	08	22.85				
Sid T. M. Noon		4	43	17.56				
Interval		14	25	05.29				
Reduction			2	21.72				
G. M. T.		14	22	43.57				

From Amer Ephs.

Moon 14ʰ	-11ʰ	09ᵐ	02ˢ.00		+10°	07′	21″.0	
motion in 1ᵐ = 1.9970				14.319				
" 22.726	+		45.38		−	5	25.4	
Tabular place	11	09	47.38		+10	01	55.6	

Moon's parallax 57′ 04.″4

" semidiam 15 34.7

Age of moon. 6ᵈ

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MC1123 1913 June. 16. 36

Times etc.

Sidereal Time	1911 June 3	14h	23m		+14h	37m
Moon's R.A.		14	27	04.8	-14	27 05.0
Correction			3	13.1		
Sid. T.		14	23	51.8		
Long.		4	44	31.05		
Mid T.		14	08	20.85		
Sid T. of Noon		4	43	17.56		
Interval		14	25	05.29		
Equation			2	21.72		
G.M.T.		14	22	43.57		

Moon's Eph.
Noon 14h -11h 09m 02.00 +10° 07' 21".0
Motion -1m 1.997 14.379 -
22.726 + 45.38 - 5 25.5
Modified 11 09 47.38 +10 01 55.5

Moon's parallax 57' 04".4
Semidiam. 15 34.7

Age of Moon. 6d

1911phae.proj

pt.	pos. ∠	resid.
1	220.9	−10
2	229.6	0
3	254.7	−11
4	270.0	+16
5	283.4	+36
6	310.4	−16
7	316.6	−4
8	344.6	−66
9	00	+64
10	132	−5

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MC 1123 1913 Mar. 13.

Chromo Center

	x	x − X₀	Δx	(x−X₀)²	(x−X₀)²+(y−Y₀)²	O − C
1	16.2186	− 1.3189	− 8	1.7416	4.0874	+ 12
2	16.0000	− 1.5375	− 7	2.3660	4.0884	+ 22
3	15.5873	− 1.9502	− 3	3.8044	4.0870	+ 8
4	15.5153	− 2.0222	0	4.0893	4.0893	+ 31
5	15.5671	− 1.9704	+ 3	3.8813	4.0907	+ 45
6	16.0000	− 1.5375	+ 7	2.3688	4.0842	− 20
7	16.1478	− 1.3897	+ 8	1.9290	4.0852	− 10
8	17.0000	− 0.5375	+ 10	0.2878	4.0774	− 88
9	17.5375	0.0000	+ 11	0.0000	4.0897	+ 35
10	18.0000	+ 0.4625	+ 11	0.2149	4.0824	− 38
				mean	4.0862	− 3

	y	y − Y₀	Δy	(y−Y₀)²
1	20.0000	− 1.5316	0	2.3458
2	20.2192	− 1.3124	0	1.7224
3	21.0000	− 0.5316	0	0.2826
4	21.5316	0.0000	0	0.0000
5	22.0000	+ 0.4684	0	0.2194
6	22.8440	+ 1.3124	0	1.7224
7	23.0000	+ 1.4684	0	2.1562
8	23.4782	+ 1.9466	+ 1	3.7896
9	23.5538	+ 2.0222	+ 1	4.0897
10	23.4981	+ 1.9665	+ 1	3.8675

Approximate Center.

x = 16.0 y = 20.2192
22.8440
43.0632
mean y = 21.5316
y − mean = 23538
R = 2.0222
x − mean = 15.5153
X₀ = 17.5375

X₀ = 17.5375
Y₀ = 21.5316

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MC 1123

1913 mar. 13.

37

Moon's Center.

	x	$x - X_0$	Δx	$(x-Y_0)^2$	$(x-Y_0)^2+(y-Y_0)^2$	O - C
1	16.2186	- 1.3189	- 8	1.7416	4.0874	+ 12
2	16.0000	- 1.5375	- 7	2.3660	4.0884	+ 22
3	15.5873	- 1.9502	- 3	3.8044	4.0870	+ 8
4	15.5153	- 2.0222	0	4.0893	4.0893	+ 31
5	15.5671	- 1.9704	+ 3	3.8813	4.0907	+ 45
6	16.0000	- 1.5375	+ 7	2.3688	4.0842	- 20
7	16.1478	- 1.3897	+ 8	1.9290	4.0852	- 10
8	17.0000	- 0.5375	+10	0.2878	4.0774	- 88
9	17.5375	0.0000	+11	0.0000	4.0897	+ 35
10	18.0000	+0.4625	+11	0.2149	4.0824	- 38
				mean:	4.0862	- 3

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.0000	- 1.5316	0	2.3458
2	20.2192	- 1.3124	0	1.7224
3	21.0000	- 0.5316	0	0.2826
4	21.5316	0.0000	0	0.0000
5	22.0000	+0.4684	0	0.2194
6	22.8440	+1.3124	0	1.7224
7	23.0000	+1.4684	0	2.1562
8	23.4782	+1.9466	+1	3.7896
9	23.5538	+2.0222	+1	4.0897
10	23.4981	+1.9665	+1	3.8675

Approximate Center.

$x = 16.0$ $\quad y = 20.2192$

22.5440

43.0632

mean y: 21.5316

y = max: 23.5538

R = 2.0222

y = min: 15.5153

X_0 = 17.5375

$X_0 = 17.5375$

$Y_0 = 21.5316$

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Formation of Normals

No	at	dt	tt
1	+ 2.02	− 15.8	− 18.4
2	+ 2.02	− 33.9	− 28.8
3	+ 1.03	− 15.6	− 4.2
4	+ 0.00	− 62.5	+ 0.0
5	+ 0.92	− 89.7	+ 21.1
6	− 2.02	+ 30.8	− 26.2
7	− 2.04	+ 13.9	− 14.7
8	− 1.05	+ 47.5	− 171.5
9	+ 0.00	+ 0.0	+ 70.6
10	+ 0.91	− 17.5	− 74.9
	− 0.05	− 142.8	− 247.0

[aa] = + 20.68 [tt] = + 20 20

[ad] = − 11.81 [td] = + 5.82 [dd] = − 3

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MC 1923 1913 Mar. 4. 38

Moon's Centre

Conditional Equations.

	a	b	O	c	O − C
1	−1.32	−1.53	+1 = +12	+16 +1.5 −9 = +22	−10
2	−1.54	−1.31	+1 = +22	+18 +1.3 −9 = +22	0
3	−1.95	−0.53	+1 = +8	+23 +.5 −9 = +19	−11
4	−2.02	+0.00	+1 = +31	+24 −0 −9 = +15	+16
5	−1.97	+0.47	+1 = +45	+23 −.5 −9 = +9	+36
6	−1.54	+1.31	+1 = −20	+18 −1.3 −9 = −4	−16
7	−1.39	+1.47	+1 = −10	+17 −1.4 −9 = −6	−4
8	−0.54	+1.95	+1 = −88	+6 −1.9 −9 = −22	−66
9	0.00	+2.02	+1 = +35	−0 −2.0 −9 = −29	+64
10	+0.46	+1.97	+1 = −38	−.5 −1.9 −9 = −33	−5

+116 −112

Average (O − C) = 23

Normal Equations

a	b	c
+20.68	−0.05	−11.81 = −143
−0.05	+20.20	+5.82 = −247
−11.81	+5.82	+10.00 = −5

$\frac{\Delta a}{\Delta c}$ = +0.571

+.005	−0.00	−0.03 = −0
+11.81	−0.03	−6.75 = −82
	+2020	+5.79 = −247
	+5.79	+3.25 = −85
	−5.79	−1.66 = +71
	−	+1.59 = −14
	−10.30	−5.79 = +151
	+9.90	= −96

$\frac{\Delta b}{\Delta c}$ = −0.787

c = −9

b = −10

−0.10	+0.05	+0.09 = −0
+41.05	−20.20	−3.475 = +10
+20.58		−11.72 = −143
+41.00		−28.93 = −237
−16.62		+11.72 = +96
+3.96		= −47

a = −12

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MC 1723 1913 Mar 24. 38

Morris Cauter

Condutional Equations.

	a	b	O	c	O − C
1	−1.32	−1.53	+1 : +12	+16 + 15 − 9 : +22	−10
2	−1.54	−1.31	+1 : +22	+18 + 13 − 9 : +22	0
3	−1.95	−0.53	+1 : +8	+23 + 5 − 9 : +19	−11
4	−2.02	−0.00	+1 : +31	+24 − 0 − 9 : +15	+16
5	−1.97	+0.47	+1 : +45	+23 − 5 − 9 : +9	+36
6	−1.54	+1.31	+1 : −20	+18 − 13 − 9 : −4	−16
7	−1.39	+1.47	+1 : −10	+17 − 14 − 9 : −6	−4
8	−0.59	+1.95	+1 : −88	+6 − 19 − 9 : −22	−66
9	0.00	+2.02	+1 : +35	−0 − 20 − 9 : −29	+64
10	+0.46	+1.97	+1 : −38	−5 − 19 − 9 : −33	−5

+116 −112

Average (O − C) = 23

Normal Equations

a	b	c	
+20.68	−0.05	−11.81	= −143
−0.05	+20.20	+5.82	= −247
−11.81	+5.82	+10.00	= −5
+0.05	−0.00	−0.03	= −0
+11.81	−0.03	−6.75	= −82
	+20.20	+5.79	= −247
	+5.79	+3.25	= −85
	−5.79	−1.66	= +71
		+1.59	= −14

c = −9

−10.30	−5.79		= +151
+9.90			= −96

b = −10

−0.10	+0.05	+0.09	= −0
+41.05	−20.20	−3.75	= +10
+20.58		−11.72	= −143
+41.00		−28.93	= −237
−16.62		+11.72	= +96
+3.96			= −47

a = −12

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MC 1123 1913 Mar 4.

Moon's Mean Position (1911.0)

$X_0 = 17.53775$ $Y_0 = 21.53166$

$\frac{1}{2}a = -6$ $\frac{1}{2}b = -5$

17.53769 21.53111

From Preliminary Reduction $X = 17.6393$ $Y = 21.4949$

Plate Constants

ax	−7 2	− 2
by	+ 17	+ 10
c	− 17	− 8
	17.6395	

$\xi = -0.03605$ $\eta = -0.50511$

log = 9.555691n

cos 9.999403

const: 8.507124

log tan δ: 9.22599

ξ²: 9.11388

η₁: 5.39311

η₁: + 0

log η₀: 9.703388n

const: 7.33115

(α − A) = 1.05564n (δ − D) = 2.37223n

α − A: − 11.37

A = 11 07 49

α = 11 07 37.63

Red: + 0.78

α = 11 07 38.41

(δ − D): − 3 55.6

D = +9 32 38

δ = +9 28 42.4

Red: − 1.5

δ' = +9 28 40.9

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MC 1123

1913 Mar. 4.

Moon's Mean Position (1911.0)

$X_0 = 17.5375$ $\quad Y_0 = 21.5316$

$\frac{1}{2}a = -6$ $\quad \frac{1}{2}b = -5$

17.5369 $\quad 21.5311$

From Preliminary Reduction $X = 17.6393$ $\quad Y = 21.4949$

Plate Constants

ax	+72	−2
by	+17	+10
c	−17	−8

$\xi = -0.3605$

log = 9.556911n

cos δ 9.99403

const: 8.50724

$(\alpha - A) = 1.05564$ n

$\alpha - A = -11.37$

$A = 11\ 07\ 49$

$\alpha = 11\ 07\ 37.63$

Red. + 0.78

$\alpha = 11\ 07\ 38.41$

$\eta = -0.5051$

log tan δ: 9.2259

ξ^2 = 9.1138

η_1 = 5.3931

η_1 = + 0

log η_0: 9.703398n

const: 7.33115

$(\delta - D)$ = 2.37223n

$(\delta - D) = -3\ 55.6$

$D = +9\ 32\ 38$

$\delta = +9\ 28\ 42.4$

Red. − 1.5

$\delta = +9\ 28\ 40.9$

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1123

Red. ad locum apb.

H+α	0ʰ	13ᵐ	= 3° 15′
H	13	05	
α	11	08	
G	20	03	
G+α	7	11	= 107° 45′

$\delta_0 = +9^\circ 29'$

l cos δ	9.9940
i	0.3900 n
(L)	0.3840 n

l cos(G+α)	9.4841 n
g	0.9011
sin	9.9788
tan δ	9.2228
	8.8239

l sin δ	1.2168
cos(H+α)	9.9993
h	1.3074
sin	8.7535
sec δ	0.0060
	8.8239

(g′)	0.3852 n
(g)	8.9266

(h′)	0.5235
(h)	8.8908

b	+0.62
g	+0.08
h	+0.08
	+0.78

δ′	−243
a′	+334
i	−242
	−151

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1173

Red. and transm. eph.

S_0 $+9°29'$

H + α	0	13ᵐ	3° 15′
H	13	05ᵐ	
χ	11	08	
G	20	03	
G + α	7	11	= 107° 45′

b	9.9940
L	0.3900 m
(L)	0.3840 m

b cos(G+α)	9.4841 m
J	0.9011
sin	9.9978
tan	9.2228
	8.8239

b cos S	9.2168
cos(H+α)	9.9993
b	1.3074
sin	87° 35′
sec δ	0.0060
	8.8239

(δ')	0.3852 m
(δ)	8.9266

(b')	0.5235
(b)	8.8908

b	+0.62
	+0.06
δb	+0.08
	+0.76

δ'	−2.93
δ_2'	+3.34
i	−2.42
	−1.51

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1123

Lunar Parallax.

α' =	11	07	38.41	
θ =	14	23	51.8	
	3	16	13.4	
+		49°	03'	21"
+			16	12
+		48	47	09

9.995727	
0.000000	
0.018120	
0.013847	

γ =	53	59	00
	9	28	42
	44	30	19

9.826400	
8.220147	
9.845700	
0.009213	
7.984370	

$\delta - \delta'$ =		+33	09.8
δ =	+10	07	50.7
hourly δ =	+10	01	56
O - C			-49
Cor. for Sund. radius			-0.5
O - C			-5.4

δ' =	+9°	28'	49.9"
π =		57'	04.4

9.869137	
8.220147	
9.878153	
0.000669	
7.974111	

$\alpha - \alpha' = +32' 25.32$

$= +2^m 09.55$

α =	11	09	47.96
α =	11	09	47.38
			+0.58
			+0.07
			+0.65

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1123

Lunar Parallax.

α' =	11^h	07^m	$38^s.41$
θ =	14	23	51.8
	3	16	13.4
+		49°	03' 21"
+			16 12
+		48	47 09

9.95727	
0.00000	
0.18120	
0.13847	

γ = 53 59 00

9 28 42

44 30 18

9.82640	
8.22014	
9.84570	
0.09213	
7.98437	

$\delta - \delta'$ = +33 09.8

δ = +10 07 50.7

Hour Circle δ = +10 01 55.6

O − C −4.9

Corr for δ and radius −0.5

O − C −5.4

δ' = +9° 28' 40"9

π = 57' 04.4

9.86913	
8.22014	
9.87815	
0.00669	
7.97411	

$\alpha - \alpha'$ = +32' 23".32

= + 2m 09s.55

α = 11 09 47.96

α = 11 09 47.38

+0.58

−0.07

+0.65

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MC1124 (1911 June 7). 1913 Feb. 17

Comparison Stars - Standard Coördinates.

1	no.	mag.	2.	no.	mag.
C	1916	6.7		1919	7.7
C	14h 01m	17.23	14h	02m 40.31	
ℓ		19		.31	
ℰ		.20		.34	
mean	14 01	17.21	14	02 40.32	
Prec		+ 35.62		+ 35.54	
α(1911.0)	14 01	52.83	14	03 15.86	
A =	14 09	16	14	09 16	
α-A =	- 7	23 17		- 6	00.14
sin(α-A)	-	443.09		-	360.10
log	2.64649n			2.55642n	
cos δ	9.98732			9.98957	
ξ₀	1.14105n			1.05323n	
ξ₀ =	- 13.8372			- 11.3070	
η₁	-	68		-	46
ξ	4.1560			6.6914	
x	50457			77604	
x-ξ	+ 8.897			+ 1.0690	
C	- 13° 43'	37.6"		- 12° 26'	59.3"
ℓ		38.4			59.6
ℰ		38.1		27	00.7
mean	- 13 43	38.0		- 12 26	59.9
Prec	- 3	10.2		- 3	10.7
δ(1911.0)	- 13 46	48.2		- 12 30	10.6
D	- 13 17	23		- 13 17	23
δ-D	- 29	25.2		+ 47	12.4
sin(δ-D)	-	1765.2		+	2832.6
log	3.24679n			3.45219	
cos D	0.57794n			0.78334	
tan δ =	9.3896n			9.3459n	
ξ₀²	2.2821			2.1065	
η₁	8.7251n			8.5058n	
m₀	-3.7839			+6.0721	
m₁	- 531			- 320	
m₂	18.1630			28.0401	
m₃	18.0369			27.8644	
	- 1261			- 1757	

changed

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1913 Feb 17

Comparison Stars – Standard Coordinates

	no.		mag.		no.		mag.
	1916		6.7		1919		7.7
14h	01m	17.23		14h	02m	40.31	
			19				31
			20				34
	14	01	17.21	14	02	40.32	
			+35.62			+35.54	
(III.0)	14	01	52.83	14	03	15.86	
A =	14	09	16	14	09	16	
x-A =		-7	23.17		-6	00.14	
cos(x-A)		-443.09			-360.10		
log		2.64649n			2.55642n		
dss =		9.98732			9.98957		
ξ_0		1.14105n			1.05323n		
ξ_0 =		-13.8372			-11.3040		
ξ_1		-	68		-	46	
ξ		4.1560			6.6914		
x		5.0457			7.7604		
x-ξ		+.8897			+1.0690		
	-13	43	37.6	-12	26	59.3	
			38.4			59.6	
			38.1		27	00.7	
	-13	43	38.0	-12	26	59.9	
		-3	10.2		3	19.7	
	-13	46	48.2	-14	30	10.6	
D.	-13	17	23	-13	17	23	
δ-D		-29	25.2	+	47	12.4	
cos(δ-D)		-1765.2			+2832.6		
log		3.24679n			3.45219		
η_0		0.57794n			0.78334		
tanζ =		9.3896n			9.3459n		
ζ^2		2.2821			2.1065		
η_1		8.7251n			8.5058n		
η_0		-3.7879			+6.0721		
η_1		-	531		-	320	
η^3		18.1630			28.0401		
η		18.0369			27.8644		
		-	1251		-	1757	

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MC1124. 1913 Feb 17.

Comparison Stars – Standard Coordinates.

3	no.	mag
C	1942	8.6
c	$14^h\ 12\ 39.01$	
L	09	
E	04	
mean	14 12 39.05	
Prec.	+35.88	
α(1911.0)	14 13 14.93	
A	14 09 16	
α−A	+ 3 58.93	
sin(α−A)	238.92	
log	2.378266	
log cos δ	998594	
log ξ_0	087144	
ξ_0	+74377	
η_0	+ 26	
log	25.740 3	
ϖ	26 23 28	
ϖ − ξ_0	+7925	
C	−14° 26′ 55.4	
L	54.9	
E	55.9	
mean	−14 26 55.4	
Prec	− 3 04.4	
δ(1911.0)	−14 29 59.8	
D	−13 17 23	
ϖ − D	− 1 12 36.8	
tan(δ−D)	− 43574	
log	3.639235	
log η_0	097038	
log tan δ	9.41274	
log ξ_0	17429	
log η_1	82090	
η_0	−9.3408	
η_1	− 162	
η	176430	
η	12.1364	
η − η	− 5066	

4	no.	mag.
	1945	7.8
	$14^h\ 13^m\ 26.22$	
	.29	
	.24	
	14 13 26.25	
	+35.46	
	14 14 01.71	
	14 09 16	
	+ 4 45.71	
	+ 285.69	
	2.455906	
	999096	
	095410	
	+89970	
	+ 50	
	27.00020	
	28.19172	
	+1.1892	
	−11° 36′ 05.2	
	05.5	
	05.5	
	−11 36 05.4	
	− 3 04.0	
	−11 39 09.4	
	−13 17 23	
	+1 38 13.4	
	7 58 95.0	
	3.770487	
	1.110163	
	9.31483	
	1.89082	
	82759	
	+126366	
	− 189	
	34.61777	
	34.07723	
	− 5454	

change

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1913 Apr. 17.

47.

C	19 42	8.6
C	14h 12 39.01	
	.09	
	.04	
	14 12 39.05	
	+35.88	
(mn)	14 13 14.93	
A	14 09 16	
X-A	+ 3 58.93	
m(X-A)	238.92	
log	2.378 26	
log cos δ	9.985 94	
ξ₀	0.871 44	
η₀	+7.437 7	
Δη	+ 76	
η	25.440 3	
η	26.732 8	
η-η₀	+7925	

	1945	7.8
14h	13m 26.22	
	.29	
	.24	
14	13 26.25	
	+35.46	
14	14 01.71	
14	09 16	
+	4 45.71	
+	285.69	
	2455 90	
	9.990 96	
	0.954 10	
	+8.997 0	
+	50	
	27.002 0	
	28.191 2	
+	1189.2	

C	−14° 26′ 55.4	
	54.9	
	55.9	
	−14 26 55.4	
	− 3 04.4	
(mn)	−14 29 59.8	
D	−13 17 23	
− D	− 1 12 36.8	
m(δ-D)	− 4357.4	
log	3.639 23 ~	
log η₀	0.970 38 ~	
log tan δ	9.412 7 ~	
log ξ₀²	17429	
log η₁	82090 ~	
η₀	−9.340 8	
η₁	− 162	
η	12.643 0	
η	12.136 4	
η-η₀	− 5066	

−11	36 05.7	
	05.5	
	05.3	
−11	36 05.4	
−	3 04.0	
−11	39 09.4	
−13	17 23.	
+ 1	38 13.4	
+	5895.0	
	3.770 48	
	1.101 63	
	9.314 8 ~	
	18982	
	82759 ~	
+	12.636 6	
−	184	
	34.617 7	
	34.072 3	
	−5454	

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MC 1124 1913 Jan. 14 48.

Comp. Stars – Measures. Reseau reversed on plate.

	4 d	4 N	x d	x N
1				
50	16185	76908 7	16296	14750
18.0	15822 24	93	6759 49	14291 90
mg	17	7317	52	89
6.9	05		99	48
	18.0365	.0373	5.0454	.0460
2.	double star.			
7.8	17660	17272	17921	17417
27.9	9008 10	15852 60	15528 20	9806 06
mg.	08	62	30	06
7.7	50	05	16	08
	27.8642	.8647	7.7606	.7607
3	16030	19032	15475	17251
26.2	14660 63	10408 01	7806 00	14923 70
12.1	69	01	01	21
mg.	28	41	77	49
8.6				
	12.1366	.1363	26.2325	.2330
4				
28.1	17212	18033	17543	14236
34.1	16484 90	8760 52	9448 43	12370 16
mg	89	58	50	28
7.8	15	35	38	49
	34.0724	.0722	28.1908	.1917

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MC 1124

Comp. Stars - Measures.

	d	N	d	N
50	16185	76907	16296	14750
17.0	15822	93	67591	19291
	17	7317	52	8970
9	05		99	48
	1.80365	2.0373	5.0459	.0460
7.8	17660	17212	17921	17417
7.9	90048	158526	155280	98406
	08	62	30	06
	50	05	16	08
7.7				
	7.8642	.4647	7.7606	.7602
3	16030	19032		
6.2	14660	1040801	15475	17251
12.1	69	01	78060	149230
	28	41	01	21
8			377	49
	12.1366	.1363	2.2385	.2330
4				
16.1	17212	18033	17143	14236
14.1	16484	8760	94488	123706
	89	5852	50	28
7.8	15	35	38	49
	34.0774	.0722	2.1908	.1917

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Moon - Measures.

Rescan reversed on field.

	d	N	d	N
1		4		
17.0	18651	16860		
20.3	15-2736 41	10198 93		
	76	99		
	59	70		
	20.3377	.3330		
2				
16.5			18240	16986
21.0			13471 56	11776 69
			52	78
			42	96
			16.5219	.5217
3				
16.5			18270	16031
21.7			11845 40	12444 40
min in R			25	39
			64	39
			16.3571	.3593
4				
16.5			18218	15048
22.0			11941 37	11330 20
			38	39
			20	58
			16.3720	.3722
5				
16.8			17045	19011
23.0			15010 20	11049 50
			99	49
			50	26
			16.7964	.7974
6	16041	17310		
17.0	13890 00	9455 54		
23.3	90	40		
	35	18		
	23.2147	.2134		

possibly on phase limb.

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MC1124 1913 Jan. 14. 50

moon-measures - Rotman reversed on plate.

Z	d	w	d	w
18.0	15945	17386		
23.6	9124 49	14222 38		
	15	33		
	50	98		
	23.6829	.6841		
8				
18.4	14917	16409		
23.6	7817 32	13505 96		
mar	29	94		
	18	20		
	23.7092	.7086		
9				

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Times Etc

Eph. to stars	1911 June 7	14	17		-	14	26	
" To moon		14	20	59.5	-	14	20	59.7
Clock fast			3	15.5				
H. Sid T.		14	17	44.1				
H Long.		4	44	31.05				
G. Sid T.		19	02	15.15				
Sid T. at Noon		4	59	03.79				
Interval		14	03	11.36				
Reduction			2	18.14				
G.M.T.		14	00	53.22				
From Am. Eph.								
Noon 14^d		14^h	09^m	$00.^s31$	-	12°	31′	18.″8
motion in 1^m = 1.8730						12.701		
" $0.^m887$			+	1.66			-	11.3
Tabular place		14	09	01.97	-	12	31	30.1
Noon's parallax.				54′	39.″4			
" semidiam.				14	55.2			
Age of moon.		10^d						

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Corr. Times Etc

+ E Long	1911 June 7	14	17		− 14	26
		14	20	59.5	− 14	20 59.7
Chron. fact.			3	15.5		
H. Sid. T.		14	17	44.1		
H. long.		4	44	31.05		
G. Sid. T.		19	02	15.15		
Sid. T. to Moon		4	59	03.79		
Interval		14	03	11.36		
Reduction			2	18.14		
G.M.T.		14	00	53.22		

From Corr. Eph.

Moon 14h	14h	09m	00.s31	− 12°	31′ 18.″8
motion 1m = 1.8730			12.701		
0.887		+ 1.66		−	11.3
Tabular place	14	09	01.97	− 12	31 30.1

Moon parallax 54′ 39.″4
semidiam. 14 55.3

Age of Moon. 10d

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Centers of plates.

x	y
3.99	18.37
6.67	28.21
25.19	12.55
27.08	34.49
4 | 62.93	93.62
15.73	23.40
-18	-22
227	1.4
31	465
227	1860
681	465
70.37	651.0

R	G	Decl
14 01 53		-13 46 48
14 03 16		-12 30 11
14 13 15		-14 30 00
14 14 02		-11 39 09
4 | 31 86		4 | 12 26 08
14 08 06		-13 06 32
+ 1 10		- 10 51
14 09 16		-13 17 23

$A = 14^h\ 09^m\ 16^s$

$D = -13^\circ\ 17'\ 23''$

Plate 1124

Preliminary Reduction

x - ⅓	-9851	-1794	-4½x	-24
+8897	= -964	-3229	= -4193	-23 = -4216 -36 =
+10690	= +839	-4988	= -4149	-35 = -4184 -56 =
+7925	= -1926	-2172	= -4098	-118 = -4216 -24 =
+11892	= +2041	-6099	= -4058	-127 = -4185 -68 =
18.2932 ✓		-3898 ✓	-82 ✓	-44 ✓

+4246

-4252 = -6
-4240 = +6
-4240 = +6
-4253 = -7
= 17.3303 ✓

} incapable of improvement

y - η	+180½x	+24	+304	
-1261	+911	= -350	+36 = -314	= 0 -10
-1757	+1401	= -356	+56 = -300	= +4 +4
-5066	+4734	= -332	+24 = -308	= -4 -4
-5454	+5088	= -366	+68 = -298	= +1 +6
21.7744 ✓	+3302		+44	= 22.1394

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MC 1124-1125-1126. 1913 Feb. 17

Center of plates.

x	y	R.A.	Decl
3.99	18.37	14 01 53	-13 46 48
6.67	28.21	14 03 16	-12. 30 11
25.19	12.55.	14 13 15	-14 30 00
27.08	3449	14 14 02	-11 39 09
4 62.93	93.62	4 56 31 86	4 -12 26 08
15.73	2340	14 08 06	-13 06 32
-18	-22	+ 1 10	- 10 51
2.27	1.4	14 09 16	-13 17 23
31	465		
227	1860		
681	465		
70.37	651.0		

A = $14^h\ 09^m\ 16^s$

D = $-13^\circ\ 17'\ 23''$

Plate 1124

Preliminary Reduction.

x - ⅓	-9851	-1794	-4½x	-24
+8897	= -964	-3229	= -4193	-23 = -4216 -36 =
+10690	= +839	-4988	= -4149	-35 = -4184 -56 =
+7925	= -1926	-2172	= -4098	-118 = -4216 -24 =
+11892	+2041	-6099	= -4058	-127 = -4185 -68 =
18.2932		-3898	-82	-44

+4246

-4252 = -6
-4240 = +6
-4240 = +6
-4253 = -7
= 17.3303

} incapable of improvement.

y - η	+180½x	+24	+304
-1261	+911	= -340 +36 = -304	= 0
-1757	+1401	= -356 +56 = -300	= +4
-5066	+4734	= -332 +24 = -308	= -4
-5454	+5088	= -376 +68 = -398	= +1
21.7744	+3291	+44	= 22.1383

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Residuals

1124

		C	O	O−C
− 1	+ 5 − 4	0	0	0
− 1	+ 8 − 4	+ 3	+ 4	+ 1
− 5	+ 4 − 4	− 5	− 4	+ 1
− 5	+ 10 − 4	+ 1	+ 1	0

1125

		C	O	O−C
+ 0	− 7 + 7	0	+ 5	+ 5
+ 1	− 10 + 7	− 2	− 7	− 5
+ 2	− 5 + 7	+ 4	0	− 4
+ 2	− 12 + 7	− 3	+ 1	+ 4

		C	O	O−C
− 1	− 2 + 7	+ 4	+ 6	+ 2
− 2	− 3 + 7	+ 2	0	− 2
− 8	− 2 + 7	− 3	− 4	− 1
− 9	− 4 + 7	− 6	− 3	+ 3

1126

		C	O	O−C
+ 2	+ 3 − 12	− 7	− 7	0
+ 3	+ 4 − 12	− 5	− 4	+ 1
+ 13	+ 2 − 12	+ 3	+ 3	0
+ 13	+ 6 − 12	+ 7	+ 7	0

		C	O	O−C
+ 2	− 2 − 3	= − 3	− 1	+ 2
+ 3	− 3 − 3	= − 3	− 6	− 3
+ 10	− 1 − 3	= + 6	+ 3	− 3
+ 10	− 4 − 3	= + 3	+ 6	+ 3

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Plate constants

			1124 x-3	1124 y-m	1125 x-3	1125 y-m	1126 x-3	1126 y-m
4.162	+ 18.166	+ c =	− 10	+ 5	− 4	− 7		− 11
669	+ 28.04	+ c =	+ 4	− 7	0	− 4		− 6
2544	+ 12.64	+ c =	− 4	0	− 4	+ 3		+ 3
2700	+ 34.62	+ c =	+ 6	+ 1	+ 7	+ 7		+ 61

Mean Equations

5.42	+ 23.10	+ 1	− 3.00	− 1.00	− 7.00	− 5.50		− 8.50
26.22	+ 23.63	+ 1	+ 1.00	+ 0.50	− 1.00	+ 5.00		+ 7.00
1480	+ 15.40	+ 1	− 7.00	+ 2.50	+ 4.00	− 2.00		+ 4.00
1684	+ 31.33	+ 1	+ 5.00	− 3.00	+ 1.00	+ 1.50		+ 2.50
− 20.80	− 0.53		+ 4.00	− 1.50	− 1.00	− 10.50		− 15.50
− 2.04	− 15.93		− 17.00	+ 5.50	− 5.00	− 3.50		+ 6.50
+ 2.04	+ 0.05		+ 0.39	+ 0.15	− 0.10	+ 1.03		+ 6.52
	− 15.88		− 11.61	+ 5.65	− 5.10	− 2.47		+ 8.02
		b =	+ 0.73	− 0.36	+ 0.32	+ 0.16		+ 0.51
		a =	+ 0.17	+ 0.08	+ 0.04	+ 0.50		+ 0.73

Plate 1124

+ 2.0	− 1.5	− 2.0	+ 2.5	
+ 1.0	+ 4.7	+ 2.7	+ 3.0	
− 6.9	− 7.1	− 4.6	− 9.4	
− 3.9	− 3.9	− 3.9	− 3.9	c for (y − m)

Plate 1125

− 1.0	+ 0.5	+ 2.5	− 3.0	
− 0.4	− 2.1	− 1.2	− 1.3	
+ 8.3	+ 6.5	+ 5.5	+ 11.3	
+ 6.9	+ 6.9	+ 6.8	7.0	c for (x − 3)

+ 3.0	− 3.5	+ 1.0	− 1.5	
+ 1.7	+ 8.1	+ 4.6	+ 5.2	
+ 2.8	+ 2.8	+ 1.8	+ 3.8	
+ 7.5	+ 7.4	+ 7.4	+ 7.5	c for (y − m)

Plate 1126

− 5.5	+ 5.0	− 2.0	+ 1.5	
− 2.7	− 13.1	− 7.4	− 8.4	
− 3.8	− 3.8	− 2.5	− 5.0	
− 12.0	− 11.9	− 11.9	− 11.9	c for (x − 3)

− 3.5	+ 4.5	+ 1.0	0.0	
− 2.1	− 10.2	− 5.8	− 6.6	
+ 2.5	+ 2.6	+ 1.7	+ 3.4	
− 3.1	− 3.1	− 3.1	− 3.2	c for (y − m)

− 8.5	+ 7.0	− 4.0	+ 2.5
− 4.0	− 19.1	− 10.8	− 12.2
− 11.8	− 12.1	− 7.8	− 16.0
− 24.3	− 24.2	− 22.6	− 26.7

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Plate constants

				1174		1175		1176	
				x − 3	y − η	x − 3	y − η	x − 3	y − η
4.160	+ 18.166	+ C	=	0	+ 5	+ 6	− 7		− 1
6.69	+ 28.04	+ C	=	+ 4	− 7	0	− 4		− 6
25.44	+ 12.64	+ C	=	− 4	0	− 4	+ 3		+ 3
27.00	+ 34.62	+ C	=	+ 1	+ 1	− 3	+ 7		+ 6
	Mean Equations.								
5.42	+ 23.10	+ 1		+ 2.00	− 1.00	+ 3.00	− 5.50		− 3.50
26.22	+ 23.63	+ 1		− 1.50	+ 0.50	− 3.50	+ 5.00		+ 4.50
14.80	+ 15.40	+ 1		− 2.00	+ 2.50	+ 1.00	− 2.00		+ 1.00
16.84	+ 31.33	+ 1		+ 2.50	− 3.00	− 1.50	+ 1.50		0.00
− 20.80	− 0.53			+ 3.50	− 1.50	+ 6.50	− 10.50		− 8.00
− 2.04	− 15.93			− 4.50	+ 5.50	+ 2.50	− 3.50		+ 1.00
+ 2.04	+ 0.05			− 0.34	+ 0.15	− 0.64	+ 1.03		+ 0.78
	− 15.88.			− 4.84	+ 5.65	+ 1.86	− 2.47		+ 1.78
		b	=	+ 0.30	− 0.36	− 0.12	+ 0.16		− 0.11
		a	=	− 0.18	+ 0.08	− 0.31	+ 0.52		+ 0.36

Plate 1174

+ 2.0	− 1.5	− 2.0	+ 2.5
+ 1.9	+ 4.7	+ 2.7	+ 3.0
− 6.9	− 7.1	− 9.6	− 9.4
− 3.9	− 3.9	− 3.9	− 3.9

E for (y − η)

Plate 1175

− 1.0	+ 0.5	+ 2.5	− 3.0
− 0.4	− 2.1	− 1.2	− 1.3
+ 8.3	+ 8.5	+ 5.5	+ 11.3
+ 6.9	+ 6.9	+ 6.8	7.0

c for (x − 3)

+ 3.0	− 3.5	+ 1.0	− 1.5
+ 1.7	+ 8.1	+ 4.6	+ 5.2
+ 2.8	+ 2.8	+ 1.8	+ 3.8
+ 7.5	+ 7.4	+ 7.4	+ 7.5

c for (y − η)

Plate 1176

− 5.5	+ 5.6	− 2.0	+ 1.5
− 2.7	− 13.1	− 7.4	− 8.4
− 3.8	− 3.8	− 2.5	− 5.0
− 12.0	− 11.9	− 11.9	− 11.9

c for (x − 3)

− 3.5	+ 4.5	+ 1.0	0.6
− 2.1	− 10.2	− 5.8	− 6.6
+ 2.5	+ 2.6	+ 1.7	+ 3.4
− 3.1	− 3.1	− 3.1	− 3.2

c for (y − η)

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pt.	obs. ∠	resid.
1	222°.0	+28
2	246.3	-45
3	270.0	+14
4	276.7	-13
5	309.3	0
6	318.0	+48
7	351.3	-79
8	00	+44

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MC1124 1913 Feb 18. J4

Morris Center

	x	$x-X_0$	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	o-c
1	17.0000	-1.2924		1.6703	3.7445	+41
2	16.5218	-1.7706		3.1350	3.7358	-46
-3	16.3582	-1.9342		3.7412	3.7412	+8
4	16.3721	-1.9203		3.6875	3.7383	-21
5	16.7969	-1.4955		2.2365	3.7396	-8
6	17.0000	-1.2924		1.6703	3.7445	+41
7	18.0000	-0.2924	+1	0.0854	3.7331	-73
8	18.2924	0.0000	+1	0.0000	3.7458	+54
				mean	3.7404	-4

	y	$y-Y_0$	Δy	$(y-Y_0)^2$
1	20.3354	-1.4393	-9	2.0742
2	21.0000	-0.7747	-4	0.6008
3	21.7747	0.0000	0	0.0000
4	22.0000	+0.2253	+1	0.0508
5	23.0000	+1.2253	+7	1.5031
6	23.2140	+1.4393	+9	2.0742
7	23.6835	+1.9088	+11	3.6477
8	23.7089	+1.9342	+12	3.7458

Approximate Center

x = 170 y = 20.3354
23.2140
43.5494
Mean y = 21.7747
y-max = 23.7089
R = 1.9342
x-min = 16.3582
X_0 = 18.2924

Assume $\begin{cases} X_0 = 18.2924 \\ Y_0 = 21.7747 \end{cases}$

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Moon's Center.

	x	x − X₀	Δx	(x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	17.0000	− 1.2924		1.6703	3.7445	+ 41
2	16.5218	− 1.7706		3.1350	3.7358	− 46
3	16.3582	− 1.9342		3.7412	3.7412	+ 8
4	16.3721	− 1.9203		3.6875	3.7383	− 21
5	16.7969	− 1.4955		2.2365	3.7396	− 8
6	17.0000	− 1.2924		1.6703	3.7445	+ 41
7	18.0000	− 0.2924	+ 1	0.0854	3.7331	− 73
8	18.2924	0.0000	+ 1	0.0000	3.7458	+ 54
				mean	3.7404	− 4

	y	y − Y₀	Δy	(y − Y₀)²
1	20.3354	− 1.4393	− 9	2.0742
2	21.0000	− 0.7747	− 4	0.6008
3	21.7747	0.0000	0	0.0000
4	22.0000	+ 0.2253	− 1	0.0508
5	23.0000	+ 1.2253	+ 7	1.5031
6	23.2140	+ 1.4393	+ 9	2.0742
7	23.6835	+ 1.9088	+ 11	3.6477
8	23.7089	+ 1.9342	+ 12	3.7458

Approximate Center.

x = 17.0 y = 20.3354
23.2140
43.5494
mean y = 21.7747
y − max = 23.7089
R = 1.9342
x − min = 16.3582
X₀ = 18.2924

Assume { X₀ = 18.2924
Y₀ = 21.7747

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Formation of normal.

No.		at		an		kn
1	+	1.86	−	52.9	−	59.0
N	+	1.36	+	81.5	+	35.4
3	−	0.00	−	15.4	+	0.0
4	−	0.44	+	40.3	−	4.8
5	−	1.84	+	12.0	−	9.8
6	−	1.86	−	52.9	+	59.0
7	−	0.55	+	21.2	−	139.2
8		0.00		0.0	+	104.0
	−	1.47	+	33.8	−	14.4

[aa] = +16.23 [bb] = +1357.0

[ac] = −9.99 [bc] = +4.53 [cn] = −4

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Moon's Center.

Conditional Equations

	a	b	c	O	c	O − C
1	−1.29	−1.44	+1	= +41	−20 + 10 + 23 =	+ 13
2	−1.77	−0.77	+1	= −46	−27 + 5 + 23 =	− 1
3	−1.93	+0.00	+1	= +8	−29 − 0 + 23 =	− 6
4	−1.92	+0.23	+1	= −21	−29 − 2 + 23 =	− 08
5	−1.50	+1.23	+1	= −8	−23 − 8 + 23 =	− 08
6	−1.29	+1.44	+1	= +41	−20 − 10 + 23 =	− 7
7	−0.29	+1.91	+1	= −73	− 4 − 13 + 23 =	+ 6
8	0.00	+1.93	+1	= +54	0 − 13 + 23 =	+ 10
						+ 44
						+134 −137

Average (O−C) : 35

Normal Equations

a	b	c	
+16.23	− 1.47	− 9.99	= +34
− 1.47	+13.70	+ 4.53	= − 14
− 9.99	+ 4.53	+ 8.00	= − 4
+ 1.47	− 0.13	− 0.90	= + 3
+ 9.99	− 0.90	− 6.15	= + 21
	+13.57	+ 3.63	= − 11
	+ 3.63	+ 1.85	= + 17
	− 3.63	− 0.97	= + 3
		+ 0.88	= + 20
	− 7.13	− 3.63	= − 33
	+ 6.44		= − 44
− 3.24	+ 1.47	+ 2.60	= − 1
+30.20	−13.70	−24.20	= + 12
+12.99		− 7.39	= +33
+28.73		−19.67	= − 2
−10.95		+ 7.39	= + 1
+ 2.24			= + 34

$\frac{\Delta a}{\Delta c} = +0.591$

$\frac{\Delta b}{\Delta c} = -0.268$

c = +23

b = − 7.

a = +15+

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MC1124. 1913 Feb 21. 55

Moon's Center.

Conditional Equations.

	a	b	c	O		c	O-C
1	−1.29	−1.44	+1	= +41	−22	+10 +23 = +11	+30
2	−1.77	−0.77	+1	= −46	−30	+5 +23 = −2	−44
3	−1.93	+0.00	+1	= +8	−32	0 +23 = −9	+17
4	−1.92	+0.23	+1	= −21	−32	−2 +23 = −11	−10
5	−1.50	+1.23	+1	= −8	−25	−8 +23 = −10	+2
6	−1.29	+1.44	+1	= +41	−22	−10 +23 = −9	+50
7	−0.29	+1.91	+1	= −73	−5	−13 +23 = +5	−78
8	0.00	+1.93	+1	= +54	0	−13 −23 = +10	+44

+143 −132

Average (O-C) = 34

Normal Equations.

a	b	c	
+16.23	−1.47	−9.99	= +34
−1.47	+13.70	+4.53	= −14
−9.99	+4.53	+8.00	= −4
+1.47	−0.13	−0.90	= +3
+9.99	−0.90	−6.15	= +21
	+13.57	+3.63	= −11
	+3.63	+1.85	= +17
	−3.63	−0.97	= +3
		+0.88	= +20

c = +23

	−7.13	−3.63	= −33
	+6.44		= −44

b = −7.

−3.24	+1.47	+2.60	= −1
+30.20	−13.70	−24.20	= +12
+12.99		−7.39	= +33
+29.13		−19.67	= −2
−10.95		+7.39	= +1
+2.04			= +34

a = +17.

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Moon's mean position

X_0: 18.2924 Y_0: 21.7747
$\frac{1}{2}a$: + 8 $\frac{1}{2}b$: − 3
18.2932 21.7744

From Preliminary Constants X: 17.3303 Y: 22.1394
" plate constants ax − 3
by + 7
c − 4

ξ = −.06697
log = 9.82588 n
cos δ = 9.99824
const = 8.50724
(α − A) 1.33040 n
α − A = − 21.40
A = 14 09 16
α = 14 08 54.60
Red. + 1.58
α = 14 08 56.18

η = +0.1394
log tan δ = 9.3463 n
ξ^2 = 97518
η_1 6.1515 n
η_1 = − 1
η_0 = +0.1395
log η_0 = 9.14457
const = 733115
(δ − D) = 1.81342
δ − D = + 1 05.1
D = −13 17 23
δ = −13 16 17.9
Red = − 12.4
δ = −13 16 30.3

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MC1124. 1913 Feb. 24. 56

Moon's mean position

X_0: 18.2924 Y_0: 21.7747
a: + 8 b: − 3
18.2932 21.7744

From Preliminary Constants X: 17.3303 Y: 22.1383
" Plate Constants ax − 3
by + 7
c − 4

ξ = −0.6697
log = 9.82588n
cos δ: 9.98824
cosec: 8.50724

(A−A): 1.33040n
α−A: − 21.90
A: 14 09 16.
α: 14 08 54.10
Red. + 1.58
α: 14 08 56.18

η = +0.1383
log tan S: 9.34633n
ξ²: 9.7518
η: 6.1515n
η₀: − 1
η₀: +0.1384
log η₀: 9.14114
cosec: 7.33115
(δ+D): 1.80999
δ − D: + 1 04.6 05.1
D: −13 17 23
S: −13 16 18.4
Red: − 12.9
S: −13 16 30.3

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1124

57

Red. ad locum aft.

H			
H+A	2ʰ	59ᵐ	= 44° 45′
H	12	00	
α	14	09	
G	20	.08	
G+L	10	17	= 154° 15′

δ_0	− 13° 16′
l cos δ	9.9882
ξ	0.2855 m
(ξ)	0.2767 m

l cos(G+α)	9.9546 m
η	0.9039
sin "	9.6379
tan δ	9.3725 m
	8.8239
(δ′)	0.8585 m
(δ)	87383 m

l sin δ	9.3608 m
cos(H+L)	9.8514
h	1.3086
sin "	9.8476
sec δ	0.0118
	8.8239
(h′)	0.5208 m
(h)	99919

δ	+ 0.65
δ′	− 0.05
L	+ 0.98
	+ 1.58′

δ′	− 7.22
δ″	− 3.32
i	− 1.89
	− 12.43

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Reds. and Comm. app.

11

H+A	2h	59m	= 44° 45′
H	12	10	
α	14	09	
G	20	08	
G+α	10	17	= 154° 15′

δ_0	− 13° 16′
log cos δ	9.9882
i	0.2855 n
(i)	02767 n

log cos(G+α)	9.9546 n
g	0.9039
sin "	9.6379
tan δ	9.3725 n
f	8.8239
(g′)	6855 n
(g)	87383 n

log tan δ	9.3608 n
log cos(H+α)	9.8514
h	1.3086
sin "	9.8476
sec δ	0.0118
	8.8239
(h′)	05208 n
(α)	9.9919

b	+ 0.61
g	− 0.05
α	+ 0.98
	+ 1.54

g′	− 7.22
h′	− 3.32
i	− 1.89
	− 12.43

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1124

Lunar Parallax.

$\alpha' = 14^h\ 08^m\ 56^s.18$ ✓
$\theta = 14\ 17\ 44.1$ ✓
$+ \quad 8\ 47.9$ ✓
$+ \quad 2^\circ\ 12'\ 00''$ ✓
$+ \quad 0\ 48$ ✓
$+ \quad 2\ 11\ 12$ ✓

9.995727 ✓
0.000000
0.000032 ✓
9.995759 ✓

$\gamma = 42\ 12\ 25$ ✓
$-13\ 16\ 30$ ✓
$55\ 28\ 55$ ✓

9.826400 ✓
8.201355 ✓
9.915900 ✓
0.172755 ✓
8.116400 ✓

$\delta - \delta' = +44\ 56.8$ ✓

$\delta = -12\ 31\ 33.5$ ✓

Naut Alm $\delta = -12\ 31\ 30.1$ ✓

O − C -3.4 ✓

Cor for stand radius -0.2

Final O − C -3.6

$\delta' = -13^\circ\ 16'\ 30''.3$ ✓

$\pi = 54'\ 39''.4$ ✓

9.869133 ✓
8.201355 ✓
8.584199 ✓
0.010466 ✓
6.665153 ✓

$\alpha - \alpha' = +1'\ 35''.40$ ✓
$= +\ 06^s.36$ ✓

$\alpha = 14\ 09\ 02.54$ ✓

$\alpha = 14\ 09\ 01.97$ ✓

$+0.57$ ✓

$+0.03$

$+1.40$

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Lunar Parallax

α' =	14	08	56.18	✓
Θ =	14	17	44.1	✓
+		8	47.9	✓
+		2°	12'	00"
+			0	48
+		2	11	12
	99	57	27	✓
	0	0	0	0
	0	0	0	32 ✓
	99	57	59	✓

γ =	42	12	25	✓
−	13	16	30	✓
	55	28	55	✓

	9	82	64	0 ✓
	8	20	13	5 ✓
	99	1	50	✓
	0	1	72	75 ✓
	81	16	40	✓

δ' =	−13°	16'	30.3	✓
π =		54'	39.4	✓
		98	69	13 ✓
		8	20	13 5 ✓
		8.	58	41 9 ✓
		0	01	04 6 ✓
		6	66	51 3 ✓

$\alpha - \alpha'$ = +1' 35.40 ✓

= + 06.36 ✓

$\delta - \delta'$ = +44' 56.8 ✓

δ =	−12°	31'	33.5 ✓	α = 14 09 02.54 ✓
Naut Alm δ =	−12	31	30.1 ✓	α = 14 09 01.97 ✓
O − C			− 3.4 ✓	+ 0.57 ✓
Cor for standard			− 0.2	+ 0.03
Final O − C			− 3.6	+ 0.60

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MC1125 (1911 June 7) 1913 Feb. 18. 61

Comparison stars – Standard Coords.

Preliminary Reduction.

	1	2	3	4
x	40470	67271	25.2512	27.1352
3	41560	66914	25.4403	27.0920
x-3	-1090	+357	-1891	+1352
y	18.9012	28.7366	13.0734	35.0146
η	18.1630	28.0401	12.6430	34.6187
y-η	+7382	+6965	+4304	+3969

x-3	-1474	-3x	+3895
-1090	-2788 = -3878	-12 = -3890	= +5
+357	-4239 = -3882	-20 = -3902	= -7
-1891	-1928 = -3819	-76 = -3895	= 0
+1352	-5165 = -3813	-81 = -3894	= +1
17.127	-3.297	-53	= 17.7672

y-η	+1467x	+34	-8034
+7382	+591 = +7973	+57 = +8030	= +6 -4
+6965	+983 = +7948	+86 = +8034	= 0
+4304	+3687 = +7991	+39 = +8030	= -4
+3969	+3962 = +7931	+105 = +8036	= -3 +7
27.3526	+2586	+67	= 21.8145

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1913 Feb. 18.

Preliminary Reductions.

	1	2	3	4
x	4.0470	6.7271	25.2512	27.1352
3	4.1560	6.6914	25.4403	27.0020
x-3	-1090	+357	-1891	+1352
y	18.9012	28.7366	13.0734	35.0146
η	18.1620	28.0401	12.6430	34.6182
1-η	+7392	+6965	+4304	+3964

x-3	-147½y	-3x	+3895
-1090	-2788 =	-3878 -12 =	-3890 = +5
+357	-4239 =	-3882 -20 =	-3902 = -7
-1891	-1928 =	-3819 -76 =	-3895 = 0
+1352	-5165 =	-3813 -81 =	-3894 = +1
17.7272	-3297	-53	= 17.7672

y-η	+146x	+34	-8034
+7392	+5911 =	+7983 +57 =	+8040 = +6
+6965	+9983 =	+7948 +86 =	+8034 = 0
+4304	+3687 =	+7991 +39 =	+8030 = -4
+3964	+3962 =	+7926 +105 =	+8031 = -3
22.3526	+2586	+67	= 21.8145

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MC1125

Comp. Stars - Standard Coords.

	3	4
α	$14^h\ 13^m\ 14^s.93$	$14^h\ 14^m\ 01^s.71$
δ	$-14^\circ\ 29'\ 59''.8$	$-11^\circ\ 39'\ 09''.4$

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Mc 11275

Comp Stars - Standard Coords

	I		4
α	$14^h\ 13^m\ 14^s.93$		$14^h\ 14^m\ 01^s.71$
δ	$-14°\ 29'\ 59''.8$		$-11°\ 39'\ 09''.4$

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Comp. Stars — measures.

4

1/	d	N
4.0	16927	15789
18.9	79216 20	14804 00
mg	16	00
6.7	30	74
	18.90111	.9014

x	d	N
	18071	16750
	8557 62	16281 80
	58	83
	87	42
1	4.04772	.0469

2 double star.

6.7	16425	15772
28.7	40755 73	13139 32
mg.	81	41
7.7	46	59
	28.73765	.7368

	16089	15078
	13360 65	78000 00
	61	00
	96	68
	6.72711	.7271

3/		
25.2	18278	15987
13.1	17547 48	67010 00
mg	45	97
8.6	75	61
	13.07731	.0736

	16109	15155
	86220 20	12641 40
	16	39
	05	40
	25.25113	.2511

4/		
27.1	11520	
35.0	11379 78	10164 60
mg.	79	66
7.8		10013
	35.0141	.0150

	17831	16609
	91888 3	15269 65
	90	68
	25	09
	27.1361	.1344

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Mc 1725 1913 Jan. 15. -63.

Comp. Stars — Measures.

	d	N	d	N
1/				
7.0	16977	15789	18071	16750
8.9	7921 20	14804 00	8557 62	8181 80
wg.	16	00	58	83
6.7	30	74	87	42
	18.9011	.9014	4.0477	.0469
2/				
6.7	16425	15772	16089	15078
8.7	4075 73	13139 37	13360 65	7800 00
wg.	81	41	61	00
7.7	46	59	96	68
	28.7365	.7368	6.7271	.7271
3/				
25.2	18278	15957	16109	15155
3.1	175 47 48	670 100	6620 20	12641 40
wg.	45	97	16	39
8.0	75	67	05	40
	13.0731	.0736	25.2513	.2511
4/				
27.1	11520		17831	16609
35.0	11379 78	10164 60	9188 83	15269 65
wg.	79	66	90	63
7.8		10013	25	09
	35.0141	.0150	27.1361	.1349

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MC1025. 1913 Jan. 15. 64.

Moon — Measures.

	d	N
1		
16.4		
21.0		
	16590	18993
	9880 85	15690 02
	79	10
	93	78
	16.3289	.3287
	very oblique.	
2		
16.0	16288	17238
21.5	11759 80	11700 11
	67	11
	81	18
	21.4516	.4480
3		
17.9	17939	17585
22.0	16037 40	94 90 80
	31	80
	50	63
	15.8095	.8084
4		
15.8	17888	16600
22.3	15660 51	8811 20
	72	16
	91	88
	15.7772	.7775
5		
15.9	16837	15654
23.0	15729 38	6769 51
	29	50
	42	39
	15.8894	.4884
6	15378	15140
16.0	12850 48	7.66770
23.3	53	54
	80	22
	23.2529	.2537

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MC1025. 1.915 Jan. 15. 64.

Moon — Hercules.

	d	N	d	N
1/			+65°90	18993
			9880 85	15690 02
			79	10
			93	78
			16.3289	.3787
2/				
160	16288	17238		
15	11759 80	11700 11	very oblique	
	69	11		
	86	18		
	21.4516	.4480		
3/				
159			17959	17585
7.0			16033 40	9490 80
			31	80
			50	63
			15.8095	.8084
4/				
15.8			17888	16600
2.3			15660 51	8811 20
			72	16
			91	88
			15.7772	.7775
5/				
15.9			16857	15654
2.3			15729 38	6769 51
			79	50
			42	39
			15.8894	.8884
6/	15378	15140		
160	12850 48	7667 70		
17.2	53	54		
	80	22		
	23.2529	21.57		

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MC1125

1913 Jan. 15.

65

Moon measures.

	d	N
7		
16.7		
24.0		
	14879	18721
	11835-50	11259 73
	36	67
	94	66
	16.6956	.6945

8		
17.0	18436	17535-
24.1	16919 19	9030 44
	10	39
	37	16
	24.1520	.1519
9		
17.6	18392	16585-
24.3	15-5-10 16	9448 38
mar	15	43
2	91	65-
4.		
	24.2878	.2872
10		
18.0	16891	15-606
24.3	14275 21	8215- 18
	30	24
	92	90
	24.2666	.2625-

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MC1125

1913 Dec 15.

65

	d	N
	14879	18221
	18350	11259
	36	67
	94	66
	16.6956	.6945

8

1.0	18436	17535
4.1	16919	9030
	10	39
	37	16
	24.1520	.1519

3

7.6	18392	16585
4.3	15510	9448
	15	43
	91	65
	7.42878	.2872

10

18.0	16891	15606
4.3	14275	8215
	30	24
	92	90
	29.2666	.2625

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Times Etc.

Exp. to stars	1911 June 7	14h	29m		−	14h	38m	
" " moon		14	32	59.6	−	14	32	59.8
Clock fast			3	15.5				
H. Sid T.		14	29	44.2				
H long.		4	44	31.05				
G Sid T.		19	14	15.25				
Sid T. in moon		4	59	03.79				
Interval		14	15	11.46				
Reduction			2	20.10				
G. M. T.		14	12	51.36				
From Am. Eph.		14h	09m	00s.31		−12°	31′	18″.8
Moon 14h								
Motion in 1m = 1.8735								
" " 13.856				+ 25.96			− 2	55.8
Tabular place.		14	09	26.27		−12	34	14.6
Moon's parallax			54	39.2				
" Semidiam			14	55.3				
Age of moon. 10d								
From Am. Eph.								
Moon 14h		14	09	00.31		−12	31	18.8
Motion in 1m = 1.8733								
12.856 =				+ 24.08			− 2	43.2
Tabular place		14	09	24.39		−12	34	02.0
Moon's parallax			54	39.2				
Moon's Semidiam			14	55.2				

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Trimer Eto.

Exp. to Stars	1911 June 7	14^h	29^m		-14^h	38^m
Mean		14	32	59.6	- 14	32 59.8
Clock fast			3	15.5		
H Sid T.		14	29	44.2		
H Long.		4	44	31.05		
G Sid T.		19	14	15.25		
Sid T. to Noon		4	59	03.79		
Interval		14	15	11.46		
Reduction			2	20.10		
G. M. T.		14	12	51.36		

From Am. Eph.		14^h	09^m	$00^s.31$	-12°	$31'$ $18''.8$
Moon 14^h						
Motion in 1^m = 1.8735					12.694	
" " 13.856			+	25.96	-	2 55.4
Tabular place.		14	09	26.27	-12	34 14.6

Moon's parallax 54 39.2
Semidiam 14 55.3

Age of moon. 10d

From Am. Eph.
Moon 14^h
Motion in 1^m = 1.8733
" 12.856 =
Tabular place

14	09	00.31	-12 31	18.8
		12.694		
	+	24.08	- 2	43.2
14	09	24.39	-12 34	02.0

Moons Semidiam 14 55.2

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Pt.	pos ∠	resid.
1	225°.8	−3
2	242.3	+23
3	259.6	+10
4	270.0	−22
5	289.6	−17
6	297.7	−23
7	228.2	+5.1
8	238.3	+19
9	0.0	+10
10	8.6	−44

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MC1125 1913 Oct. 24 67

Moon's Center

	x	x − X₀	Δx · (x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	16.3288	− 1.3845	− 1 1.9171	3.7461	− 41
2	16.0000	− 1.7133	− 1 2.9357	3.7500	− 2
3	15.8090	− 1.9043	− 0 3.6263	3.7501	− 1
4	15.7774	− 1.9359	0 3.7477	3.7477	− 25
5	15.8889	− 1.8244	+ 0 3.3284	3.7493	− 9
6	16.0000	− 1.7133	+ 1 2.9351	3.7492	− 10
7	16.6950	− 1.0183	+ 1 1.0367	3.7572	+ 70
8	17.0000	− 0.7133	+ 2 0.5085	3.7539	+ 37
9	17.7133	0.0000	+ 2 0.0000	3.7524	+ 22
10	18.0000	+ 0.2867	+ 2 0.0823	3.7465	− 37
				Mean 3.7502	+ 4

	y	y − Y₀	Δy · (y − Y₀)²
1	21.0000	− 1.3516	− 8 1.8290
2	21.4498	− 0.9018	− 6 0.8143
3	22.0000	− 0.3516	− 2 0.1238
4	22.3516	0.0000	0 0.0000
5	23.0000	+ 0.6484	+ 4 0.4209
6	23.2533	+ 0.9017	+ 6 0.8141
7	24.0000	+ 1.6484	+ 10 2.7205
8	24.1520	+ 1.8004	+ 11 3.2454
9	24.2875	+ 1.9359	+ 12 3.7524
10	24.2646	+ 1.9130	+ 12 3.6642

Approximate Center

x = 16.0 y = 21.4498
23.3533
44.8031
Mean y = 22.3516
y − mean = 24.2875
R = 1.9359
ψ − min = 15.7774
X₀ = 17.7133

X₀ = 17.7133
Y₀ = 22.3516

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1911phae..6f0j

Moon's Center

	x	x − X₀	Δx	(x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	16.3288	− 1.3845	− 1	1.9171	3.7461	− 41
2	16.0000	− 1.7133	− 1	2.9357	3.7500	− 2
3	15.8090	− 1.9043	− 0	3.6263	3.7501	− 1
4	15.7774	− 1.9359	0	3.7477	3.7477	− 25
5	15.8889	− 1.8244	+ 0	3.3284	3.7493	− 9
6	16.0000	− 1.7133	+ 1	3.9351	3.7492	− 10
7	16.6950	− 1.0183	+ 1	1.0367	3.7572	+ 70
8	17.0000	− 0.7133	+ 2	0.5085	3.7539	+ 37
9	17.7133	0.0000	+ 2	0.0000	3.7524	+ 22
10	18.0000	+ 0.2867	+ 2	0.0823	3.7465	− 37
				Mean	3.7502	+ 4

	y	y − Y₀	Δy	(y − Y₀)²
1	21.0000	− 1.3516	− 8	1.8290
2	21.4498	− 0.9018	− 6	0.8143
3	22.0000	− 0.3516	− 2	0.1238
4	22.3516	0.0000	0	0.0000
5	23.0000	+ 0.6484	+ 4	0.4209
6	23.2533	+ 0.9017	+ 6	0.8141
7	24.0000	+ 1.6484	+ 10	2.7205
8	24.1520	+ 1.8004	+ 11	3.2454
9	24.2875	+ 1.9359	+ 12	3.7524
10	24.2646	+ 1.9130	+ 12	3.6642

Approximate Center.

x = 16.0 y = 21.4498
23.2533
44.7031
Mean y = 22.3516
y − mean = 24.2875
R = 1.9359
y − min = 15.7774
X₀ = 17.7133

X₀ = 17.7133
Y₀ = 22.3516

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Formation of Normals.

No	at	au	bw
1	+ 1.86	+ 56.5	+ 55.5
2	+ 1.54	+ 3.4	+ 1.8
3	+ 0.65	+ 1.9	+ 0.4
4	0.00	+ 48.5	0.0
5	- 1.18	+ 16.4	- 5.8
6	- 1.54	+ 17.1	- 9.0
7	- 1.68	- 71.4	+ 115.3
8	- 1.78	- 26.2	+ 66.5
9	0.00	0.0	+ 42.7
10	+ 0.55	- 10.7	- 70.6
	- 1.09	+ 35.5	+ 196.8

[aa] = +21.12 [bb] = +17.38

[ac] = - 11.90 [bc] = + 6.25 [an] = +4

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MC 1175 1915 Oct 24. 68

Moons Center

Conditional Equations.

	a	b	c	O	c	O − c
1	−1.38	−1.35	+1	= −41	+18 − 28 − 28 = −38	−3
2	−1.71	−0.90	+1	= −2	+22 − 19 − 28 = −25	+23
3	−1.90	−0.35	+1	= −1	+24 − 7 − 28 = −11	+10
4	−1.94	+0.00	+1	= −25	+25 + 6 − 28 = −3	−22
5	−1.82	+0.65	+1	= −9	+23 + 13 − 28 = +8	−17
6	−1.71	+0.90	+1	= −10	+22 + 19 − 28 = +13	−23
7	−1.02	+1.65	+1	= +70	+13 + 37 − 28 = +19	+51
8	−0.71	+1.80	+1	= +37	+9 + 37 − 28 = +18	+19
9	0.00	+1.94	+1	= +22	0 + 40 − 28 = +12	+10
10	+0.79	+1.91	+1	= −37	−4 + 39 − 28 = +7	−44
					+113 − 109	

Normal Equations. Average (O − c) = 22

a	b	c	
+21.12	−1.08	−11.90	= +36
−1.08	+17.38	+6.25	= +197
−11.90	+6.25	+10.00	= +4
+1.08	−.006	−0.61	= +2
+11.90	−0.61	−6.71	= +20
	+17.32	+5.64	= +199
	+5.64	+3.29	= +24
	−564	−1.80	= −65
		+1.49	= −41
	−9.66	−5.64	= −41
	+7.66		= +158
−2.06	+1.08	+1.73	= +1
+35.10	−17.38	−27.80	= −11
+19.06		−10.17	= +37
+32.02		−21.55	= +186
−15.10		+10.17	= −88
+3.96			= −51

$\frac{\Delta a}{\Delta c} = +0.547$

$\frac{\Delta b}{\Delta c} = -0.326$

c = −28

b = +21.

a = −13.

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NC 1125 1913 Feb. 24. 68

Moons Center

Conditional Equations.

	a	b	c	O				O - C
1	-1.38	-1.35	+1	= -41	+18	-28	-28	= -38	-3
2	-1.71	-0.90	+1	= -2	+22	-19	-28	= -25	+23
3	-1.90	-0.35	+1	= -1	+24	-7	-28	= -11	+10
4	-1.94	+0.00	+1	= -25	+25	+0	-28	= -3	-22
5	-1.82	+0.65	+1	= -9	+23	+13	-28	= +8	-17
6	-1.71	+0.90	+1	= -10	+22	+19	-28	= +13	-23
7	-1.02	+1.65	+1	= +70	+13	+34	-28	= +19	+51
8	-0.71	+1.80	+1	= +37	+9	+37	-28	= +18	+19
9	0.00	+1.94	+1	= +22	0	+40	-28	= +12	+10
10	+0.29	+1.91	+1	= -37	-4	+39	-28	= +7	-44

+115 -109

Normal Equations. Average (O-C) = 22

a	b	c	
+21.12	-1.08	-11.90	= +36
-1.08	+17.38	+6.25	= +197
-11.90	+6.25	+10.00	= +4
+1.08	-0.06	-0.61	= +2
+11.90	-0.61	-6.71	= +20
	+17.32	+5.64	= +199
	+5.64	+3.29	= +24
	-5.64	-1.80	= -65
		+1.49	= -41
	-9.66	-5.64	= -41
	+7.66		= +158

c = -28

b = +21-

-2.06	+1.08	+1.73	= +1
+35.10	-17.38	-27.80	= -11
+19.06		-10.17	= +37
+32.02		-21.55	= +186
-15.10		+10.17	= -88
+3.96			= -51

a = -13-

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MC 1125

1913 Feb 25

Moon's Mean position (1911.0)

$X_0 = 17.7133$ $Y_0 = 22.3516$

$\frac{1}{2}\Delta = \frac{-6}{17.7127}$ $\frac{1}{2}\Delta = \frac{+10}{22.3526}$

From Preliminary Constants $X = 17.7672$ $Y = 21.8145$

∴ Plate constants $ax = +1 \quad -6$

$by = -8 \quad -3$

$c = +7 \quad +7$

21.8143

$\xi = -0.2328$

$\log \xi = 9.366988_n$

$\log \cos \delta = 9.988177$

const. 8.507124_n

$\therefore (\alpha - A) = 0.871577_n$

$(\alpha - A) = -7.44$

$A = 14\ 09\ 16$

$\alpha = 14\ 09\ 08.56$

Red. $= +1.59$

$\alpha' = 14\ 09\ 10.15$

$\eta = -0.1857$

$\log \tan \delta = 9.37725_n$

$\delta^2 = 8.7340$

$\therefore \eta_1 = 5.1599_n$

$\log \eta_0 = 9.26881_n$

∴ const. $= 7.33115$

$\therefore (\delta - D) = 1.93766_n$

$\delta - D = -126.6$

$D = -13\ 17\ 23$

$\delta = -13\ 18\ 49.6$

Red. $= -12.4$

$\delta' = -13\ 19\ 02.0$

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MC 1125

1915 Feb 25

Moon's Mean Position (1911.0)

$X_0 = 17.7133$ $Y_0 = 22.3516$

$\frac{1}{2}a = -6$ $\frac{1}{2}b = +10$

17.7127 22.3526

From Preliminary Constants $X = 17.7672$ $Y = 21.8145$

∴ Plate Constants $ax = +1$ -6

$by = -8$ -3

$c = +7$ $+7$

$\xi = -0.2328$

$\log \xi : 9.366988_n$

$\cos \delta : 9.98817$

$\text{const} : 8.50724$

$\therefore (\alpha - A) : 0.871578_n$

$(\alpha - A) : -\ 7.44$

$A = 14\ 09\ 16$

$\alpha = 14\ 09\ 08.56$

$\text{Red} : +\ 1.59$

$\alpha = 14\ 09\ 10.15$

$\eta = -0.1855$

$\log \tan \delta : 9.37255_n$

$\delta^2 = 8.7340$

$\therefore \eta_1 = 5.1599_n$

$\log \eta_0 : 9.26834_n$

$\therefore \text{dist} : 7.33115$

$\therefore (\delta - D) : 1.93764_n$

$\delta - D = -\ 1\ 26.6$

$D = 13\ 17\ 23$

$\delta = -13\ 18\ 49.6$

$\text{Red} = -1.24$

$\delta' = -13\ 19\ 02.0$

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1125 Red. ad locum apls.

δ_0 : $-13^\circ\ 19'$

H+α	3^h	00^m	$= 45^\circ$
H	12	51	
α	14	09	
G	20	08	
G+α	10	17	$= 154^\circ\ 15'$

log S	9.9882
i	0.2875 m
(k)	0.2760 m

log cos(G+α)	9.9546 m
δ	0.9039
sin "	9.6379
tan S	9.3742 m
	8.8239

log sin S	9.3624 m
cos(H+α)	9.8495
h	1.3086
sin "	9.8495
sec S	0.0118
	8.8237

(δ')	0.8585 m
(δ)	8.7899 m

(h')	0.5205 m
(h)	9938

t	+0.65
δ	−0.05
h	+0.99
	+1.59

δ'	+7.22
h'	−3.32
i	−1.89
	+12.43

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1125 Red. ad Procumm apto.

H+α'	3h	00m	= 45°
H	12	51	
α	14	09	
G	20	08	
G+α	10	17	= 154° 15'

δ₀	−13° 19'
l cos S	9 9 8 8 2
i	0 2 8 7 8 n
(L)	0.2760 n

l cos S	9 9 8 8 2
cos(G+α)	9 5 4 6 n
δ	0 9 0 3 9
sin "	9 6 3 7 9
tan S	9 3 7 4 2 n
	8 8 2 3 9

l sin S	9 3 6 2 4 n
cos(H+α)	9 8 4 9 5
l	1 3 0 8 6
sin "	9 8 4 9 5
sec S	0 0 1 1 8
	8.8 2 3 7

(δ')	0 8 5 8 5 n
(δ)	8.7 8 9 9 n

(l')	0 5 2 0 5 n
(l)	9 9 3 8

f	+0.65
δ	−0.05
L	+0.99
	+1.59

δ'	∓7.22
L'	−3.32
i	−1.89
	∓12.43

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Lunar Parallax.

$\alpha' = 14^h\ 09^m\ 10^s.15$ ✓
$\theta = 14\ 29.442$ ✓
$+ \quad 20\ 34.05$ ✓
$+ \quad 5^\circ\ 08'\ 31''$ ✓
$+ \quad 1\ 51$ ✓
$+ \quad 5\ 06\ 40$ ✓

9.957727 ✓
0.000000
000173 ✓
995900 ✓

$\phi = 42\ 17\ 58$ ✓
$-13\ 19\ 02$ ✓
$55\ 37\ 00$ ✓

9.826400 ✓
8.201338 ✓
9.916600
017198 ✓
8.116320 ✓

$\delta - \delta' = +44\ 56.2$ ✓

$\delta = -12\ 34\ 05.8$ ✓

Hartaker $\delta = -12\ 34\ 020$ ✓

O - C $- 3.8$ ✓

Cor for Hand radius $+ 0.2$ ✓

O - C $- 36$ ✓

$\delta' = -13^\circ\ 19'\ 02''.0$ ✓

$\Pi = 54'\ 39''.2$ ✓

9.869133 ✓
8.201338 ✓
8.952422 ✓
0.011053 ✓
903341 ✓

$\alpha - \alpha' = +3'\ 42''.76$ ✓
$= +104^s.85$ ✓

$\alpha = 14\ 09\ 25.00$ ✓

$\alpha = 14\ 09\ 24.39$ ✓
$+ \quad 0.61$ ✓
$- \quad 003$ ✓
$+ \quad 0.58$ ✓

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Lunar Parallax.

$\alpha' = 14^h\ 09^m\ 10^s.15$
$G = 14\ 29\ 49.2$
$+ \quad 20\ 34.05$
$+ \quad 5^\circ\ 06'\ 31''$
$+ \quad 1\ 51$
$+ \quad 5\ 06\ 40$

9.957727
0.000000
0.000173
9.957900

$\delta' = -13^\circ\ 19'\ 02''.0$
$\pi = 54'\ 39''.2$

9.869133
8.201333
8.952425
0.010853
9.033341

$\alpha - \alpha' = +3'\ 42''.76$
$= +104^s.85$

$\phi = 42\ 18\ 02$
$-13\ 19\ 02$
$55\ 37\ 04$

9.826400
8.201333
9.916611
0.017198
8.116332

$s - s' = +44\ 56.2$

$s = -12\ 34\ 05.8$

Use Value $s = -12\ 34\ 020$

$O - C$	-3.8
Corr for Stand. radius	$+0.2$
$O - C$	-3.6

$\alpha = 14\ 09\ 24.00$

$\alpha = 14\ 09\ 2439$

	$+0.61$
	-0.03
	$+0.58$

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