

KG

11366

v. 900



Volume XXIM

Harvard

Lunar

Plates



No.

1398

1402

1403

1911phae.proj.1

PRINCETON UNIVERSITY OBSERVATORY
PRINCETON, N. J.

U. S. A.

Harvard Lunar Plates

Measures and Reductions.

Mary Fowler

Volume XXIII

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1398 Stars - Measures

1913 June 2.

	α	δ	N		α	δ	N	
1	18781				16579			
7.5	955863			estimated	1086568			estimated
33.9	60				70			
	85				60			
	<u>33.9206</u>				<u>33.9208</u>			
2					<u>7.4300</u>			<u>7.4330</u>
12.8	14130				17934			18758
12.0	1360510			70 68	1559090			1104545
	05				90			41
					10			28
	<u>12.0523</u>				<u>12.7864</u>			<u>7.684</u>
3								
23.2	17164				18401			15350
31.5	1113027				1098992			1271009
	3033				89			06
	50				80			40
	<u>31.6025</u>				<u>23.2605</u>			<u>2639</u>
					1300911			11310
4	19185				0711			1068290
27.0	1577464				12449			78
11.3	70							
	68				<u>27.0590</u>			<u>0627</u>
	<u>11.3408</u>							
					<u>3414</u>			

1398 Stars - Ucamurus

1913 June 2

1

$\begin{array}{r} L \\ 75 \\ 339 \end{array}$
 $\begin{array}{r} 18781 \\ 955863 \\ 60 \\ 85 \end{array}$

339206

$\begin{array}{r} 128 \\ 120 \end{array}$
 $\begin{array}{r} 14130 \\ 13605 \\ 05 \end{array}$

120523

$\begin{array}{r} 232 \\ 315 \end{array}$
 $\begin{array}{r} 17164 \\ 1113027 \\ 2035 \end{array}$

316025

$\begin{array}{r} 4 \\ 27.0 \\ 113 \end{array}$
 $\begin{array}{r} 19185 \\ 157746 \\ 70 \\ 68 \end{array}$

11.3408*intended*339208

$\begin{array}{r} 12170 \\ 70 \\ 11642 \end{array}$

0527

$\begin{array}{r} 14640 \\ 1066060 \\ 60 \\ 35 \end{array}$

6022

$\begin{array}{r} 18682 \\ 12085 \\ 8690 \\ 68 \end{array}$

3414

$\begin{array}{r} 16579 \\ 1086568 \\ 70 \\ 60 \end{array}$

7.4300

$\begin{array}{r} 1793 \\ 15590 \\ 90 \\ 10 \end{array}$

127864

$\begin{array}{r} 18401 \\ 1098992 \\ 87 \\ 80 \end{array}$

23.2605

$\begin{array}{r} 13009 \\ 0711 \end{array}$

27.05907.4330

$\begin{array}{r} 18758 \\ 1104545 \\ 41 \end{array}$

28

7684

$\begin{array}{r} 15350 \\ 1271009 \\ 0609 \\ 40 \end{array}$

2639

$\begin{array}{r} 11310 \\ 1068290 \\ 7890 \end{array}$

0627

14C1398 Moon Measures. 1913 June 2.

2

1 18850
18.0 16370
20.3 7577
min 44
8 20.2474

15720
817095
60
20
2468

2 17.0 17891
20.5 12630
15-20 77
20.5262

14603
985251
50
03
5248

3 16.5
21.0

18567
12815
1017
50
16.4256

14640
1034532
2922
28
4302

4 15.9
22.0

12142
1168081
76

175046
5446
9325

159538

9575

5 15.9
22.4
min
in 26

11111
1033030
35

907568
8068
8312

159221

9238

6 16.0
23.0

1125051
55
11088

8370
818181
71

16.0164

0192

14C1398

Moon Measures

1913 June 2

2

18.0 18850
 203 16370
 203 7577
 8 44
20.2474

2 170 17891
 205 12630
 15 20
 77
20.5262

3
 165
 210

4
 159
 220

5
 159
 224
 224
 224

6
 16.0
 230

15720
 817095
 80
 20
2468

14603
 985251
 50
 03
5248

18567
 12815
 1017
 50
164256

12142
 1168081
 78

159538

11111
 1033030
 3530

159221

1125051
 5551
 11088

160164

14640
 1034532
 2922
 28
4302

975046
 5446
 9325

9575

907568
 8068
 8312

9238

8370
 818181
 71

0192

MC1398

Moon Measures.

1913 June 2 3

$$\begin{array}{r} 7 \text{ a} \\ 16.6 \\ 24.0 \end{array}$$

$$\begin{array}{r} d = \\ 16095 \\ 1285955 \\ 50 \\ 80 \\ 16.6765 \\ 18804 \\ 1203825 \\ 20 \\ 90 \\ 6771 \end{array}$$

$$\begin{array}{r} 8 \\ 17.0 \\ 24.2 \\ 14420 \\ 1220000 \\ 00 \\ 10 \\ 242218 \end{array}$$

$$\begin{array}{r} 16716 \\ 89127 \\ 1517 \\ 00 \\ 2212 \end{array}$$

M161398

brown nebulas

1913 June 2 3

7

a

4

N

d =

N

16.6

24.0

16095

15804

1285955

1202825-

50

20

80

90

16.676567718

14420

16716

17.0

12200

00

8912

242

00

157

10

00

2422182212

MC1398

1913 June 3.

4

	1	2	3	4
α	7.4315	12.7674	23.2622	27.0608
β	8.2356	13.7042	24.0802	28.0034
$2-\beta$	-8041	-9368	-8180	-9426

γ	33.9207	12.0525	31.6024	11.3411
δ	34.5820	12.7455	32.3644	12.1269
$\gamma-\eta$	-6613	-6930	-7620	-7858

Plate Constants Rejecting (2)

$\alpha-\beta$	-61.54	-0.22	+1.0128	
-8041 - 2086	= -10127	-1	= -1.0128	= 0
-8180 - 1944	= -10124	-5	= -1.0129	= -1
-9426 - 697	= -10123	-5	= -1.0128	= 0
18.0500 - 1376		-4		= 18.9248
$\gamma-\eta$	+63.52	+0.22	+0.27	+6133
-6613 + 472	= -6141	+1	= -6140	+7 = -6133 = 0
-7620 + 147.7	= -6143	+5	= -6138	+6 = -6132 = +1
-7858 + 1718	= -6140	+5	= -6135	+2 = -6133 = 0
22.3731 + 1146		+4	+4	= 23.1018

Tabulated $b+d = -1.5$ $a = +0.2$
 Observed $= -2.2$ $+0.2$

$e = -1.2$
 -0.2

NIC1398

1913 June 3

4

	1	2	3	4
2	7.4315	12.7674	23.2622	27.0608
3	8.2356	13.7042	24.0802	28.0034
2-3	-8041	-9368	-8180	-9426

	1	2	3	4
4	33.9207	12.0525	31.6024	11.3411
4	34.5820	12.7415	32.3644	12.1269
4-4	-6613	-6930	-7620	-7858

Plate Constant Rectifying (2)

2-3	-61.54	-0.22	+1.0128
-8041	-2086	-10127	-1
-8180	-1944	-10124	-5
-9426	-697	-10123	-5
18.0500	-1376	-4	
4-4	+63.52	+0.22	+0.21
-6613	+472	-6141	+1
-7620	+1477	-6143	+5
-7858	+1718	-6140	+5
22.3731	+1146	+4	+4

Tabulated $b+d = -1.5$ $a = +0.2$
 Observed $= -3.2$ $+0.2$

$c = -1.2$
 -0.2

MC1398 Times etc. 1913 July 2. 5

exp to stars.	1911 Nov. 5	3 ^h 52 ^m	- 4 ^h 04 ^m
- moon		3 58 21.0 ^s	3 58 21.4 ^s
clouds low		0 43.4 ^s	
Alfa T.		3 59 04.6 ^s	
H. long.		4 44 31.0 ^s	
G. Sid T.		8 43 35.6 ^s	
Sid T. in Moon.		14 54 23.7 ^s	
Interval		17 49 11.9 ^s	
Reduction		2 55.1 ^s	
G. M. T.		17 46 16.7 ^s	

From Chant. Alt.		R. A.		Decl.
Moon 18 ^h	2 ^h 18 ^m	41.17 ^s	+ 14	28 22.6 ^s
Motion in 1 ^m	2.2662 ^s		14.906 ^s	
" -13.7205 ^s		-31.09 ^s	- 3	24.5 ^s
Tabular place.	2 18	10.08 ^s	+ 14	24 58.1 ^s
Moon's Parallax		59' 40.6 ^s		
Zenith distance		16 17.1 ^s		

MC1398 Times etc

1913 July 2

5

exp. times	1911 Nov 5	3	52	- 4	04
moon		3	58	210	3 58 214
clouds etc			0	434	

Planet T	3	59	046
H long	4	44	3105
G Sid T	8	43	3565
Sid T in Moon	14	54	2372
Interval	17	49	1193
Reduction		2	5516
G T. T.	17	46	1677

From Chart Above		P. A.	Decl
moon 18 ^h	2 ^h 18 ^m	41.17	+14 28 226
Moon in 1 ^m	22662		14906
-13.7205		-31.09	-3 245
Tabular place	2 18	1008	+14 24 581
Moon's parallax		59' 40.6	
semidiam		16 17.1	

Formulas of Normals.

	at	sum	bn	bn
1	+ 0.10 -	1.1 -	49.0	
2	+ 4.94 +	57.8 +	101.5	
3	+ 2.12 +	105.8 +	89.4	
4	+ 2.78 -	20.9 -	3.7	
5	- 0.00 +	19.1 +	0.0	
6	- 1.26 +	50.6 +	15.6	
7	- 3.23 -	100.0 -	118.3	
8	- 1.94 -	47.2 -	83.1	
	- 0.49 +	64.1 -	147.6	

$$[pe] = -1139$$

$$[pa] = +19.75$$

$$[pk] = -1.62$$

$$[pb] = +16.42$$

$$[en] = -3$$

nr.	pos. \angle	resid.
1	180.0	-5
2	209.5	-70
3	229.8	-71
4	259.8	+17
5	270.0	+1
6	287.2	-11
7	319.9	+87
8	330.5	+56

HAC 1398

Moores Center

1913 July 3

6

	x	$(x - x_0)$	$(x - x_0)^2$	K^2	$0 - c$
1	18.0000	-0.0494	0.0024	4.5248	+23
2	17.0000	-1.0494	1.1012	4.5170	-55
3	16.4279	-1.6215	2.6292	4.5160	-65
4	15.9556	-2.0938	4.3840	4.5235	+10
5	15.9230	-2.1264	4.5216	4.5216	-9
6	16.0178	-2.0316	4.1274	4.5200	-25
7	16.6768	-1.3726	1.8840	4.5298	+73
8	17.0000	-1.0494	1.1012	4.5270	+45
Mean				4.5225	-3

38

	y	$(y - y_0)$	Δy
-1	20.2471	-2.1264	-2
2	20.5255	-1.8480	-2
3	21.0000	-1.3735	-1
4	22.0000	-0.3735	0
5	22.3735	0.0000	0
6	23.0000	+0.6265	0
7	24.0000	+1.6265	+1
8	24.2215	+1.8480	+2

Approximate Center

$$x = 17.0 \quad y = 20.5255$$

$$24.2215$$

$$44.7470$$

$$\text{Mean } y = 22.3735$$

$$y - \text{min} = 20.2471$$

$$R = 21.264$$

$$x - \text{min} = 15.9230$$

$$x_0 = 18.0494$$

$$\text{Center } \begin{cases} x_0 = 18.0494 \\ y_0 = 22.3735 \end{cases}$$

M1398

Minimum Center

1913 July 3.

6

	x	$(x - x_0)$	$(x - x_0)^2$	R^2	$y - y_0$
1	18.0000	-0.0494	0.0024	4.5248	+23
2	17.0000	-1.0494	1.1012	4.5170	-55
3	16.4279	-1.6215	2.6292	4.5160	-65
4	15.9556	-2.0938	4.3840	4.5235	+10
5	15.9230	-2.1264	4.5216	4.5216	-4
6	16.0178	-2.0316	4.1274	4.5200	-25
7	16.6768	-1.3726	1.8840	4.5298	+73
8	17.0000	-1.0494	1.1012	4.5270	+45
Mean				4.5225	-3

	y	$(y - y_0)$	Δy
-1	20.2471	-2.1264	-2
2	20.5255	-1.8480	-2
3	21.0000	-1.3735	-1
4	22.0000	-0.3735	0
5	22.3735	0.0000	0
6	23.0000	0.6265	0
7	24.0000	1.6265	+1
8	24.2215	1.8480	+2

Approximate Center

$$x = 17.0 \quad y = 20.5255$$

$$24.2215$$

$$44.7470$$

$$\text{Mean } y = 22.3735$$

$$y - \text{mean} = 20.2471$$

$$R = 2.1264$$

$$x - \text{mean} = 15.9230$$

$$x = 18.0494$$

$$\text{Center } \left\{ \begin{array}{l} x_0 = 18.0494 \\ y_0 = 22.3735 \end{array} \right.$$

$$0.52229$$

MC1898 Conditional Equation

1913 July 7

7

	a	b	c	0		c	0-c
1	-0.05	-2.13	+1	+23	-	1+15+14 = +26	-5
2	-1.05	-1.85	+1	-55	-	12+13+14 = +15	-40
3	-1.62	-1.37	+1	-65	-	18+10+14 = +6	-91
4	-2.09	-0.37	+1	+10	-	24+3+14 = -9	+17
5	-2.13	+0.00	+1	-9	-	24-0+14 = -10	+7
6	-2.03	+0.63	+1	-25	-	23-5+14 = -14	-19
7	-1.37	+1.63	+1	+73	-	16-12+14 = -14	+87
8	-1.05	+1.85	+1	+45	-	12-13+14 = -11	+56

Normal Equations

-157+161

Average = 40

$$\begin{aligned}
 +19.75 - 0.49 - 11.39 &= +64 \\
 -0.49 + 16.42 - 1.62 &= -148 \\
 -11.39 - 1.62 + 8.00 &= -3
 \end{aligned}$$

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

$$\begin{aligned}
 +0.49 - 0.01 - 0.28 &= +1\frac{1}{2} \\
 +11.39 - 0.28 - 6.56 &= +37
 \end{aligned}$$

$$\begin{aligned}
 +16.41 - 1.90 &= -146\frac{1}{2} \\
 -1.90 + 1.44 &= +34
 \end{aligned}$$

$$\frac{\Delta y}{\Delta z} = +0.25$$

$$\begin{aligned}
 +1.90 - 0.22 &= -17 \\
 +1.22 &= +17
 \end{aligned}$$

$$c = +14$$

$$\begin{aligned}
 -2.51 + 1.90 &= +45 \\
 +13.90 &= -101
 \end{aligned}$$

$$b = -75$$

$$\begin{aligned}
 +0.34 + 0.49 - 0.24 &= +0 \\
 -115.45 - 16.42 + 81.09 &= -30
 \end{aligned}$$

$$\begin{aligned}
 +20.09 - 11.63 &= +64 \\
 -115.94 + 79.47 &= -178
 \end{aligned}$$

$$\begin{aligned}
 -16.93 + 11.63 &= -26 \\
 +3.14 &= +38
 \end{aligned}$$

$$a = +12$$

$$\begin{aligned}
 +3.44 + 0.49 - 2.42 &= +1 \\
 -115.45 - 16.42 + 81.09 &= -30
 \end{aligned}$$

$$\begin{aligned}
 +23.19 - 13.81 &= +65 \\
 +115.94 + 79.47 &= -178
 \end{aligned}$$

$$\begin{aligned}
 -20.20 + 13.81 &= -31 \\
 +2.99 &= +34
 \end{aligned}$$

$$a = +11$$

red. adl. Comm. app.

S = +13° 55'

H+x 5 16-79
 H 2 59
 x 2 17
 G 21 53
 G+x 0 10 = 2 30

cross 94871
 L 07765
 L 07436

l cos(G+x) 99996
 g 11816
 m 86397
 lcos 93941
 88239

8 11812
 8 80393

f +1.98
 g +0.01
 h +1.32
 +3.31

lcos 93811
 cos(H+x) 92806
 h 12912
 lcos 99920
 fcos 00129
 88239

h 99529
 h 01200

f +1.518
 g +0.90
 h +1.82
 +2.188

M61978 Conditional Equation

1913 July 7

7

	a	b	c		d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
1	-0.05	-2.13	+1.2	+23	-	1	+1.5	+1.4	+26	-	5																
2	-1.05	-1.85	+1.2	-55	-	2	+1.3	+1.4	+15	-	70																
3	-1.62	-1.37	+1.2	-65	-	18	+1.0	+1.4	+6	-	71																
4	-2.09	-0.37	+1.2	+10	-	24	+3	+1.4	-	7	+17																
5	-2.13	+0.00	+1.2	-9	-	24	-	0	+1.4	-	10	+7															
6	-2.03	+0.63	+1.2	-25	-	23	-	5	+1.4	-	14	-19															
7	-1.37	+1.63	+1.2	+73	-	16	-12	-1.4	-	14	+87																
8	-1.05	+1.85	+1.2	+45	-	12	-13	+1.4	-	14	+56																

Normal Equation

Average 40

$$\begin{aligned}
 +19.75 &= 0.49 - 11.39 = +6.4 \\
 -0.49 + 16.42 &= 16.2 = -14.8 \\
 -11.39 - 16.2 + 8.00 &= -3
 \end{aligned}$$

$$\begin{aligned}
 +0.49 &= 0.01 = -0.28 = +1\frac{1}{2} \\
 +11.39 &= 0.28 = 6.56 = +37
 \end{aligned}$$

$$\begin{aligned}
 +16.41 &= 1.90 = -1.46 \\
 -1.90 + 1.44 &= +3.4
 \end{aligned}$$

$$\begin{aligned}
 +1.90 &= 0.22 = -17 \\
 +1.22 &= +17
 \end{aligned}$$

$$\begin{aligned}
 -2.51 + 1.90 &= +4.0 \\
 +1.390 &= -1.01
 \end{aligned}$$

b = 75

$$\begin{aligned}
 +0.34 + 0.49 &= 0.29 = 0 \\
 -11.545 - 16.42 + 21.04 &= -30
 \end{aligned}$$

$$\begin{aligned}
 +2.09 &= 1.165 = +6.6 \\
 -11.599 + 79.47 &= -17.8
 \end{aligned}$$

$$\begin{aligned}
 -16.93 + 11.63 &= -26 \\
 +3.14 &= +38
 \end{aligned}$$

a = 12

$$\begin{aligned}
 +3.44 + 0.49 &= 2.42 = +1 \\
 -11.545 - 16.42 + 69.09 &= -30
 \end{aligned}$$

$$\begin{aligned}
 +13.19 &= 13.81 = +6.5 \\
 +11.594 + 79.47 &= -13.2
 \end{aligned}$$

$$\begin{aligned}
 -20.20 &= 13.81 = -31 \\
 +2.44 &= +34
 \end{aligned}$$

a = 11

Red ad. brown, aff.

$$\delta = +13^{\circ} 55'$$

$$\begin{array}{rcl} H + \alpha & 5^h & 16^m = 79^{\circ} \\ H & 2 & 59 \\ \alpha & 2 & 17 \\ G & 21 & 53 \\ G + \alpha & 0 & 10 = 2^{\circ} 30' \end{array}$$

$$\begin{array}{rcl} \cos S & 9.9871 \\ \downarrow & 0.7765 \\ (L) & 0.7636 \end{array}$$

$$\begin{array}{rcl} L \cos(G + \alpha) & 9.9996 \\ g & 1.1816 \\ \sin & 8.6397 \\ \cos & 9.3941 \\ & 8.8239 \end{array}$$

$$\begin{array}{rcl} L \sin S & 9.3811 \\ \cos(H + \alpha) & 9.2806 \\ h & 1.2912 \\ \sin & 9.9920 \\ \sec S & 0.0129 \\ & 8.8239 \end{array}$$

$$\begin{array}{rcl} g' & 1.1812 \\ g & 8.0393 \end{array}$$

$$\begin{array}{rcl} h' & 9.9529 \\ h & 0.1200 \end{array}$$

$$\begin{array}{rcl} f & +1.98 \\ g & +0.01 \\ h & +1.32 \\ \hline & +3.31 \end{array}$$

$$\begin{array}{rcl} g' & +1.518 \\ h' & +0.90 \\ L & +5.80 \\ \hline & +21.88 \end{array}$$

MC1398

July 8.

Mean Position

(1911.0)

$$\begin{array}{r} X_0 = 18.0494 \\ \pm a = \quad \quad + 6 \\ \hline 18.0500 \end{array}$$

$$\begin{array}{r} Y_0 = 22.3735 \\ \pm b = \quad \quad - 4 \\ \hline 22.3731 \end{array}$$

From plate constants $X = 18.9248$ $Y = 23.1018$

$$\xi = +0.9248$$

$$\eta = +1.1018$$

$$\log \xi = 9.96605$$

$$\log \tan S = 9.3925$$

$$\cos \delta = 9.98705$$

$$\xi^2 = 9.9321$$

$$\cos \epsilon = 8.50724$$

$$\eta_+ = 6.3780$$

$$(d - A) = 1.47176$$

$$\eta_1 = +2$$

$$q - A = +29.63$$

$$\eta_0 = +1.1016$$

$$A = 2 \ 16 \ 19$$

$$\log \eta_0 = 0.04202$$

$$X_0 = 2 \ 16 \ 48.63$$

$$\cos \epsilon = 7.33110$$

$$Red = +3.31$$

$$G - D = 27.1087$$

$$\alpha' = 2 \ 16 \ 51.94$$

$$S - D = +08 \ 33.9$$

$$D = +13 \ 46 \ 50$$

$$S_0 = +13^\circ \ 55' \ 23.9''$$

$$Red = +21.9$$

$$S' = +13 \ 55 \ 45.8$$

398

Lunar Parallax

$$\alpha = 2^h 16^m 51.94^s$$

$$\delta = 3^{\circ} 09' 04.6''$$

$$-p = +1^{\circ} 42' 12.66''$$

$$+ 25^{\circ} 33' 10''$$

$$+ 9.50$$

$$+ 25^{\circ} 23' 20''$$

$$995.727$$

$$000000$$

$$004911$$

$$000138$$

$$\gamma = 45^{\circ} 05' 28''$$

$$12^{\circ} 55' 44''$$

$$31^{\circ} 09' 42''$$

$$982640$$

$$823951$$

$$971387$$

$$014982$$

$$792960$$

$$S - S = + 29.140$$

$$S - S = 114.24 \quad 59.8 \quad \lambda = 2.18 \quad 10.59$$

$$\text{Lunar distance} = + 1.4 \quad 24 \quad 58.1 \quad \lambda = 2.18 \quad 10.08$$

$$O - C = + 1.7 \quad 10.51$$

$$\text{Red. Island } \gamma = - 0.7 \quad 10.11$$

$$O - C = + 1.4 \quad 10.40$$

$$S = + 13^{\circ} 55' 45.8''$$

$$\Pi = 59^{\circ} 40.6''$$

$$986913$$

$$823951$$

$$963482$$

$$001390$$

$$775736$$

$$\alpha - \alpha = + 19^{\circ} 39.75''$$

$$+ 1^{\circ} 18.65''$$

MG1398

Mars Mean Position (1911-12)

8

$$\begin{array}{r}
 X_0 = 18.0494 \\
 \Delta = +6 \\
 \hline
 18.0500
 \end{array}
 \qquad
 \begin{array}{r}
 Y_0 = 22.3735 \\
 \Delta = -4 \\
 \hline
 22.3731
 \end{array}$$

From plate constant $X = 18.9248$ $Y = 23.1018$

$$Z = +0.9248$$

$$\eta = +1.1018$$

$$\log S = 9.96605$$

$$\log \tan S = 9.3525$$

$$\cos S = 9.98705$$

$$S = 9.9321$$

$$\sin S = 8.50724$$

$$\eta_1 = 6.3780$$

$$(d - A) = 1.47176$$

$$\eta_1 = +2$$

$$q - A = +29.63$$

$$\eta_0 = +1.1016$$

$$A = 2.1619$$

$$\log \eta = 0.04202$$

$$q_0 = 2.1648.63$$

$$\sin \eta = 7.331157$$

$$Red = +3.31$$

$$(d - D) = 27.1087$$

$$\alpha = 2.165194$$

$$S - D = +0.8339$$

$$D = +13.4650$$

$$S_0 = +13^{\circ} 55' 23.9''$$

$$Red = +2.19$$

$$S = +13.55458$$

$$\begin{array}{r}
 1398 \\
 \alpha = 2^h 16^m 51^s.94 \\
 \theta = 3 \quad 59 \quad 04.6 \\
 \theta - \alpha = +1 \quad 42 \quad 12.66 \\
 = +25^{\circ} 33' 10''
 \end{array}$$

$$\begin{array}{r}
 + \quad \quad 9 \quad 50 \\
 + 25 \quad 23 \quad 20
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 0.04411 \\
 \hline
 0.00138
 \end{array}$$

$$\begin{array}{r}
 \gamma = 45^{\circ} 05' 28'' \\
 13 \quad 55 \quad 46 \\
 31 \quad 09 \quad 42
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.23951 \\
 9.71387 \\
 0.14982 \\
 \hline
 792960
 \end{array}$$

$$S - S' = +29 \quad 14.0$$

$$S = +14 \quad 24 \quad 59.8 \quad \alpha = 2 \quad 18 \quad 10.59$$

$$\text{Wantalm } S = +14 \quad 24 \quad 58.1 \quad \alpha = 2 \quad 18 \quad 10.08$$

$$O - C \quad +1.7 \quad +0.51$$

$$\text{Red. Island. r.} \quad -0.3 \quad -0.11$$

$$O - C \quad +1.4 \quad +0.40$$

$$S' = +13^{\circ} 55' 45.8''$$

$$T_1 = 59' 40.6''$$

$$\begin{array}{r}
 9.86913 \\
 8.23951 \\
 9.63482 \\
 0.01390 \\
 \hline
 775736
 \end{array}$$

$$\alpha - \alpha' = +19' 39.75''$$

$$= +1'' 18.65''$$

MC 1402 Stars - Measures.

1913 June 3.

9

	d	v	d	v
$\frac{1}{11.9}$	15699	16172	10289	131.0201
$\frac{1}{10.9}$	686050	1501418	977070	000
	60	20	71	12600
	90	60		

10.8842.884618.9481.9499

$\frac{2}{16.0}$	16537	18827	18208	15690
$\frac{2}{34.5}$	1475755	1060000	873131	1518635
	55	00	29	29
	30	69	90	80
	<u>34.1780</u>	<u>.1988</u>	<u>16.0539</u>	<u>.0556</u>

$\frac{3}{33.5}$	1042430	12270	18930	16685
$\frac{3}{17.0}$	2630	1215750	1340008	1217370
	10300	56	09	70
			05	63
	<u>16.9873</u>	<u>.9884</u>	<u>33.4489</u>	<u>.4501</u>

ANC 1402 Stars - measures.

1913 June 3.

9

$\begin{array}{r} \text{d} \quad 4 \\ 1 \quad 15699 \\ 11.9 \quad 686050 \\ 10.9 \quad 60 \\ \quad 90 \end{array}$

$\begin{array}{r} \sim \\ 16172 \\ 1501418 \\ \quad 20 \\ \quad 60 \end{array}$

$\begin{array}{r} \text{d} \quad \sim \\ 10289 \quad 1310201 \\ 977070 \quad 00 \\ 71 \quad 12600 \end{array}$

10.854288461894519499

$\begin{array}{r} 2 \\ 160 \\ 34.2 \\ 16537 \\ 1475755 \\ \quad 55 \\ \quad 30 \\ \hline 34.1750 \end{array}$

$\begin{array}{r} 18827 \\ 1060000 \\ \quad 00 \\ \quad 09 \\ \hline 1988 \end{array}$

$\begin{array}{r} 18208 \\ 873131 \\ \quad 2931 \\ \quad 90 \\ \hline 16.0539 \end{array}$

$\begin{array}{r} 15690 \\ 11-186 \\ \quad 2935- \\ \quad 80 \\ \hline 0556 \end{array}$

$\begin{array}{r} 3 \\ 335 \\ 170 \\ 1042430 \\ \quad 2630 \\ \quad 10300 \\ \hline 16.9873 \end{array}$

$\begin{array}{r} 12270 \\ 1215750 \\ \quad 56 \\ \hline 9884 \end{array}$

$\begin{array}{r} 18930 \\ 1340008 \\ \quad 0908 \\ \quad 05- \\ \hline 33.4489 \end{array}$

$\begin{array}{r} 16685- \\ 1217370 \\ \quad 70 \\ \quad 63 \\ \hline 4501 \end{array}$

Remeasure 1.

$$\begin{array}{r} 11535 \\ 10769 \\ \hline 8092 \end{array}$$

26

19,525-0

MC1402 {measured with daylight} 1913 June 3. 10

Moon Measures

d

N

d

N

N

1
19.5
21.0

possibly on
phase limit

16100
11335
21 26
75
19.5250

18480
13188
00 00
50
5269

2
20.0 18954
21.5 14430 50
4050
40
21.4504

16646
11121 36
3636
34
4491

3
20.3
22.0

18940
12120 10
10
30
20.3180

18038
14844 38
40
18
3191

4
20.5
22.7
max
in
2L

17850
12510 00
00 00
32
20.4663

17064
12390 70
82 85
50
4675

5
20.4
23.0

17831
12400 09
07
21
20.4579

16071
11470 80
80
59
4588

6
20.0 15452
24.1 14170 74
90
34
24.1272

15160
6385 66
85
36
1247

NIC1402

[measured with day light] 1913 June 3.

10

Moon Measures

d

4

N

d

N

N

 $\frac{1}{19.5}$
 $\frac{21.0}{21.0}$
possibly on
phase limit.
$$\begin{array}{r} 16100 \\ 11335.25 \\ 21 \\ 75 \\ \hline 195250 \end{array}$$

$$\begin{array}{r} 18480 \\ 13188 \\ 0000 \\ 50 \\ \hline 5269 \end{array}$$

$$\begin{array}{r} 2 \\ 20.0 \\ 21.5 \\ \hline 18954 \\ 14430.50 \\ 4050 \\ 40 \\ \hline 214504 \end{array}$$

$$\begin{array}{r} 16646 \\ 1112136 \\ 3636 \\ 34 \\ \hline 4691 \end{array}$$
 $\frac{2}{20.3}$
 $\frac{22.0}{22.0}$

$$\begin{array}{r} 18940 \\ 12120.10 \\ 10 \\ 30 \\ \hline 203180 \end{array}$$

$$\begin{array}{r} 18038 \\ 1484438 \\ 40 \\ 18 \\ \hline 3191 \end{array}$$
 $\frac{4}{20.5}$
 $\frac{22.7}{22.7}$
 $\frac{22.7}{22.7}$
 $\frac{22.7}{22.7}$

$$\begin{array}{r} 17850 \\ 12510.00 \\ 00 \\ 32 \\ \hline 204663 \end{array}$$

$$\begin{array}{r} 17064 \\ 1239070 \\ 8285- \\ 50 \\ \hline 4675 \end{array}$$
 $\frac{5}{20.4}$
 $\frac{23.0}{23.0}$

$$\begin{array}{r} 17831 \\ 12400.09 \\ 07 \\ 21 \\ \hline 204579 \end{array}$$

$$\begin{array}{r} 16071 \\ 1147080 \\ 80 \\ 59 \\ \hline 4558 \end{array}$$

$$\begin{array}{r} 6 \\ 20.0 \\ 24.1 \\ \hline 15452 \\ 14170.74 \\ 90 \\ 34 \\ \hline 241272 \end{array}$$

$$\begin{array}{r} 15160 \\ 6385.86 \\ 85-86 \\ 36 \\ \hline 1247 \end{array}$$

MC1402 Moon-Measures.

1913 June 3. 11

<u>7</u>	<u>d</u>	<u>4</u>	<u>N</u>
19.0	14488		19129
24.8	618080		1741010
	80		10
	70		10
	<u>24.8294</u>		<u>.8285</u>

<u>8</u>	184	18881	18106
24.9	943130	1754551	
max	30	60	
u	69	96	
if	<u>24.9440</u>	<u>.9447</u>	

<u>9</u>	50	17897	17102
24.8	867262	16309	
	50	9511	
	82	90	
	<u>24.9222</u>	<u>.9204</u>	

MIC1402 Moon-Measures

1913 June 3

11

$\begin{array}{r} 2 \\ 190 \\ 24.8 \end{array} \quad \begin{array}{r} d \\ 14488 \\ 618080 \\ 80 \\ 70 \\ \hline 24.8294 \end{array} \quad \begin{array}{r} n \\ 19129 \\ 1741010 \\ 10 \\ 10 \\ \hline .8285 \end{array}$

$\begin{array}{r} 5 \\ 184 \\ 249 \\ \text{may} \\ 6 \\ 28 \\ \hline 249440 \end{array} \quad \begin{array}{r} 18881 \\ 943130 \\ 30 \\ 69 \\ \hline .9447 \end{array} \quad \begin{array}{r} 18106 \\ 1754551 \\ 60 \\ 96 \\ \hline \end{array}$

$\begin{array}{r} 9 \\ 150 \\ 24.8 \end{array} \quad \begin{array}{r} 17897 \\ 867262 \\ 50 \\ 82 \\ \hline 24.9222 \end{array} \quad \begin{array}{r} 17102 \\ 16309 \\ .9121 \\ 90 \\ \hline .9204 \end{array}$

NIC 1402 Standard Coords.

1913 June 4. 1v

Cape No. 619 mag 7.5				Cape No. 628 mag 7.5				Cape No. 659 mag 7.1			
L	4	12	17.14	4	14	24.99		4	24	21.64	
L			22							65	
E			07							62	
mean	4	12	17.14					4	24	21.64	
Prece			+39.25			+40.11				+39.61	
X	4	12	56.39	4	15	05.10		4	25	01.25	
A	4	16	25	4	16	25		4	16	25	
X-A	-	3	28.61	-	1	19.90		+	8	36.25	
Sin(X-A)			-208.60			-79.90				+516.13	
log..			2.31931			1.90255				2.71276	
cos S			996533			995508				996275	
.. 30			0.79188			0.36487				1.18275	
E ₀			-6.1927			-2.3167				+15.2318	
E ₁			-			9				92	
E ₂			11.8047			15.6824				33.2410	
E ₃			11.9490			16.0548				33.4495	
2-3			+1.443			+3.724				+20.85	
C	+22	33	42.2	+25	35	13.2		+23	22	11.3	
L			42.9							11.4	
E			41.9							10.5	
mean	+22	33	42.3					+23	22	11.1	
Prece			+1			+137.7				+1	
S	+22	35	21.9	+25	36	50.9		+23	23	40.2	
D	+24	01	28	+24	01	28		+24	01	28	
S-D	-	1	26	+1	35	22.9		-	0	37	
tan(S-D)			-5167.2			+5724.4				-2267.9	
log..			3.71326			3.75773				3.35562	
.. 30			1.04441			1.08888				0.68677	
tan S			9.6191			9.6807				9.6361	
.. 32			1.5838			0.7897				2.3655	
.. 31			82563			74638				90550	
.. 30			-11.0767			+1227.11				-4.8615	
.. 31			+			29				+11.35	
.. 32			10.9413			34.2740				17.2520	
.. 33			10.8844			34.1784				16.9878	
.. 34			-			956				-2642	

NIC 1402 Standard Cords

1913 June 4. 1V

Cape No. 619 mag 7.5	Cape No. 624 mag 7.4	Cape No. 619 mag 7.1
C 4 12 17 14	4 14 24 99	4 24 21 64
L 22		65
E 07		62
mean 4 12 17 14		4 24 21 64
Prece + 39 25	+ 40 11	+ 39 61
X 4 12 56 39	4 15 05 10	4 25 01 25
A 4 16 25	4 16 25	4 16 25
X-A - 3 28 61	- 1 19 90	+ 8 36 25
sin(X-A) - 20 860	- 79 90	+ 51 613
log 2.31931m	1.90255m	2.71276
cos 996533	995508	996275
Σ 0.79188m	0.36487m	1.18275
Σ - 6.1927	- 2.3167	+ 15.2318
Σ - 26	- 9	+ 92
Σ 11.8047	15.6824	33.2410
Σ 11.9490	16.0548	33.4495
2-3 +.1443	+ 3.724	+ 20.85
C + 22 33 42 2	+ 25 35 13 2	+ 23 22 11.3
L 42 9		11.4
E 41 9		10.5
mean + 22 33 42 3		+ 23 22 11.1
Prece + 1 39.6	+ 1 37.7	+ 1 29.1
S + 22 35 21 9	+ 25 36 50 9	+ 23 23 40.2
D + 24 01 28	+ 24 01 28	+ 24 01 28
S-D - 1 26 06 1	+ 1 35 22 9	- 0 37 47.8
tan(S-D) - 51 672	+ 57 24 4	- 22 67 9
log 3.71326m	3.75773	3.35562m
mo 1.04441m	1.08888	0.68677m
tan S 9.6191	9.6807	9.6361
Σ 15838	07297	23655
Σ 82563	74638	90550
Σ - 11.0767	+ 12.2711	- 4.8615
Σ + 180	+ 29	+ 1135
Σ 109413	34.2740	17.2520
Σ 108844	34.1784	16.9878
Σ - 569	- 950	- 2642

Times etc

Exp/total 1911 Nov. 7 4^h 28^m - 4^h 40^m
 noon 4 34 44.5 - 4 34 05.1
 clock slow 0 43.5

H Sid T. 4 34 48.3
 H Long. 4 44 31.05
 G Sid T. 9 19 19.35
 Sid T in noon 15 02 16.84
 Interval 18 47 02.51
 Reduction 2 59.72
 G in T. 18 14 02.79

from bank Albu P₁ place
 noon 18^m 4 16 08.64 + 24 25 18.5
 between 2.6262 9.141
 140465 + 36.89 + 2 08.4
 Tabular place 4 16 45.53 + 24 27 26.9

noons parallel
 sun declin. 16 29.4

1402-1403

Center of Plate

1913 June 4,

13

x	y	R. A.	Decl.
11.9490	10.8844	4 12 56	+22 35 22
16.0548	34.1784	15 05	25 36 51
33.4495	16.9878	25 01	23 23 40
61.45	62.05	53 02	11 35 53
20.46	20.78	4 17 41	+23 51 58
-18	-22	-1 16	+9 30
2.46	1.22	4 16 25	+24 01 28
31	465		
246	570"		
738			
76.26			

$$A = 4^h 16^m 25^s$$

$$D = +24^\circ 01' 28''$$

Plate Constant

$x - \bar{x}$	-97.64	-2.2x	-354
+1443	-1062	+381-26	+355 = +1
+3724	-3336	+388-35	+353 = -1
+2085	-1658	+427-74	+353 = -1
18.3113	-2224	-40	= 18.0495
$y - \bar{y}$	+96.5x	-0.44	-579
-569	+1153	+584-4	+580 = +1
-956	+1549	+593-14	+579 = 0
-2642	+3228	+586-7	+579 = 0
22.7879	+1767	-9	= 22.9058

From tables $b + a = 0.0$ $a = -0.3$ $e = -0.3$
 observed $+1.1$ $+2.2$ $+0.4$

Times at

Ex/total 1911 Nov. 7 4^h 28^m - 4^h 40^m
 - noon 4 34 44.5 - 4 34 05.1
 clock slow 0 43.5

H. Sid T. 4 34 48.3
 H. Long 4 44 31.0
 G. Sid T. 9 19 19.3
 Sid T. in noon 15 02 16.8
 Interval 18 17 02.5
 Reduction 2 59.7
 G. in T. 18 14 02.7

from hand Alm P. h. local
 noon 18^m 4 16 08.64 + 24 25 18.5
 motion 2.6262 9.141
 " 14.0465 + 36.89 + 2 08.9
 Tabular place 4 16 45.53 + 24 27 26.9
 Moon's parallel 60 25.4
 " semidiam. 16 29.4

1402-1403

Center of Plate

1913 June 4.

13

α	δ	R.A.	Decl.
11.9490	108844	4 12 56	+22 35 22
16.0548	34 1784	15 05	25 36 51
33.4495	16 9878	25 01	23 23 40
61.45	62.05	53 02	11 35 53
20.46	2078	4 17 41	+23 51 58
-18	-22	-1 16	+9 30
2.46	1.22	4 16 25	+24 01 28
31	465		
246	570		
738			
76.26			

$$A = 4^h 16^m 25^s$$

$$D = +24^\circ 01' 28''$$

Plate Constant

$\alpha - \beta$	-9764	-222	-354
+1443	-1062	+381-26	+355
+3724	-2336	+388-35	+353
+2085	-1658	+427-74	+353
183113	-2224	-40	-18.0495
$\eta - \gamma$	+9652	-044	-579
-569	+1153	+584-4	+580
-956	+1549	+593-14	+579
-2642	+3228	+586-7	+579
22.7879	+1767	-9	229058

From tables $b+a = 0.0$ $a = -0.3$ $a = -0.3$
 observed $+1.1$ $+2.2$ $+0.4$

MRC140.2 M30's Core

1913 July 3

14

	x	$x - X_0$	$(x - X_0)^2$	K^2	$10 - c$
1	19.5250	+1.2056	1.4534	4.6862	reject
2	20.0000	+1.6796	2.8210	4.5849	-183
3	20.3186	+1.9982	3.9928	4.6294	+262
4	20.4669	+2.1465	4.6074	4.6074	+42
5	20.4584	+2.1380	4.5710	4.6118	+86
6	20.0000	+1.6796	2.8210	4.5849	-183
7	19.0000	+0.6796	0.4618	4.5876	-156
8	18.3204	0.0000	0.0000	4.6079	+47
9	18.0000	-0.3204	0.1026	4.6118	+86
Mean				4.6032	+1

	y	$y - Y_0$	y	$(y - Y_0)^2$
1	21.0000	-1.7979	-1	3.2328
2	21.4498	-1.3281	0	1.7639
3	22.0000	-0.7979	0	0.6366
4	22.7979	0.0000	0	0.0000
5	23.0000	+0.2021	0	0.0408
6	24.1260	+1.3281	0	1.7639
7	24.8290	+2.0311	+1	4.1258
8	24.9444	+2.1465	+1	4.6079
9	24.9213	+2.1234	+1	4.5092

Approx. Center

$$x = 20.0 \quad y = 21.4698$$

$$24.1260$$

$$45.5958$$

$$y - \text{max} = 22.7979$$

$$K = 21.465$$

$$x - \text{max} = 20.4669$$

$$X_0 = 18.3204$$

$$\text{Center } \begin{cases} X_0 = 18.3204 \\ Y_0 = 22.7979 \end{cases}$$

1913 July 3 known Center

1913 July 3

	x	$x - X_0$	$(x - X_0)^2$	K^2	$y - Y_0$
1	19.5260	+1.2056	1.4534	4.6862	neglect
2	20.0000	+1.6796	2.8210	4.5849	-1.83
3	20.3186	+1.9982	3.9928	4.6294	+2.62
+4	20.4669	+2.1465	4.6074	4.6074	+4.2
5	20.4584	+2.1380	4.5710	4.6118	+8.6
6	20.0000	+1.6796	2.8210	4.5849	-1.83
7	19.0000	+0.6796	0.4618	4.5876	-1.86
8	18.3204	0.0000	0.0000	4.6079	+4.7
9	18.0000	-0.3204	0.1026	4.6118	-8.6
			Mean	4.6032	+1

	y	$y - Y_0$	$(y - Y_0)^2$
1	21.0000	-1.7979	3.2328
2	21.4698	-1.3281	1.7639
3	22.0000	-0.7979	0.6366
4	22.7979	0.0000	0.0000
5	23.0000	+0.2021	0.0408
6	24.1260	+1.3281	1.7639
7	24.8290	+2.0311	4.1258
+8	24.9444	+2.1465	4.6079
9	24.9213	+2.1234	4.5092

Approx. Center

$$x = 20.0 \quad y = 21.4698$$

$$24.1260$$

$$9.55958$$

$$y = \text{mean} \quad 22.7979$$

$$K = 24.9444$$

$$x = \text{max} \quad 21.465$$

$$X_0 = 20.4669$$

$$18.3204$$

$$\text{Center} \begin{cases} X_0 = 18.3204 \\ Y_0 = 22.7979 \end{cases}$$

$$22.7979$$

pt.	pos. c	resid.
2	128.4	-51
3	111.4	+28
4	90.0	-5
5	84.4	+79
6	50.3	-49
7	18.6	-62
8	0.0	+40
9	351.8	+18

Moon's Center

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)^2 / (y - y_0)^2$	$0 - c$
1	19.5260 + 121.56	1.4777	4.6746	+2.53	
2	20.0000 + 1.6896	2.8547	4.6452	-41	
3	20.3186 + 200.82	4.0329	4.6537	+44	
4	20.4669 + 21.565	4.6505	4.6505	+12	
5	20.4584 + 21.480	4.6139	4.6589	+96	
6	20.0000 + 1.6896	2.8547	4.6452	-41	
7	19.0000 + 0.6896	0.4755	4.6420	-73	
8	18.3804 00000	0.0000	4.6509	+16	
9	18.0000 - 0.3104	0.0963	4.6481	-12	
		mean =	4.6493	+1	

	y	$y - y_0$	Δy	$(y - y_0)^2$
1	21.0000	-1.7879	-1	3.1968
2	21.4498	-1.3381	0	1.7905
3	22.0000	-0.7879	0	0.6208
4	22.7879	0.0000	0	0.0000
5	23.0000	+0.2121	0	0.0450
6	24.1260	+1.3381	0	1.7905
7	24.8290	+2.0411	+1	4.1665
8	24.9444	+2.1565	+1	4.6509
9	24.9213	+2.1334	+1	4.5518

Approximate Center

$$x = 20.0 \quad y = 21.4498$$

$$24.1260$$

$$45.5758$$

$$\text{mean } y = 22.7879$$

$$y = \text{max} = 24.9444$$

$$R = 2.1565$$

$$x = \text{max} = 20.4669$$

$$\text{mean } x = 18.3104$$

$$\text{Center } \begin{cases} x_0 = 18.3104 \\ y_0 = 22.7879 \end{cases}$$

Linear Center

15

	x	$x - x_0$	$(x - x_0)^2$	$(x - x_0)(y - y_0)$	$y - y_0$
1	195260 + 12156	14777	46746	253	
2	200000 + 16896	28547	46952	-41	
3	203186 + 20082	40327	46537	+44	
4	204669 + 21565	46505	46505	+12	
5	204584 + 21480	46139	46589	+96	
6	200000 + 16896	28547	46452	-41	
7	190000 + 06896	04755	46420	-73	
8	183804 00000	00000	46509	+16	
9	180000 - 03164	00963	46481	-12	
mean = 46493					

	y	$y - y_0$	y^2	$(y - y_0)^2$
1	210000 - 17879	-1	31969	
2	214498 - 13381	0	17905	
3	220000 - 07879	0	06208	
4	227879 00000	0	00000	
5	230000 + 02121	0	00450	
6	241260 + 13381	0	17905	
7	248290 + 20411	+1	41665	
8	249444 + 21565	+1	46509	
9	249213 + 21334	+1	45518	

Approximate Center

$$x = 20.0 \quad y = 214498$$

$$241260$$

$$455758$$

$$\text{mean } y = 227879$$

$$y - \text{max} = 249444$$

$$21565$$

$$x - \text{max} = 204669$$

$$\text{mean } x = 183104$$

$$\text{Center } \begin{cases} x_0 = 183104 \\ y_0 = 227879 \end{cases}$$

Formation of Normals.

	ab	ac	bc
2	- 2.26	- 69.3	+ 54.9
3	- 1.59	+ 88.4	- 34.8
4	+ 0.00	+ 25.9	+ 0.0
5	+ 0.45	+ 206.4	+ 20.2
6	+ 2.26	- 69.3	- 54.9
7	+ 1.41	- 150.4	- 148.9
8	+ 0.00	+ 0.0	+ 34.6
9	- 0.66	+ 3.7	- 25.6
	- 0.39	+ 135.4	- 154.5

$$aa = +19.58$$

$$bb = +17.62$$

$$ac = +10.08$$

$$bc = +5.75$$

$$c = +1$$

$$-167 + 165$$

Average = 41

$$\frac{\Delta z}{\Delta n} = -1.13$$

$$\begin{array}{r} + \quad 0.39 - 0.01 + 0.20 = + \quad 3 \\ - \quad 1.008 + 0.20 = 5.19 = - \quad 70 \end{array}$$
$$\begin{array}{r} + 1.761 + 5.95 = -1.51 \\ + 5.95 + 2.81 = -6.9 \end{array}$$

$$\frac{\Delta y}{\Delta x} = -0.73$$

$$\begin{array}{r} - \quad 5.95 - 2.01 = + \quad 3.94 \\ + \quad 0.80 = - \quad 1.8 \end{array}$$

$$c = -22,5$$

$$= 12.60 - 5.95 = +6.65$$

1 - - - - -

$$\begin{array}{r} + 0.68 + 0.39 + 0.54 = + 1.61 \\ - 30.90 - 17.62 - 24.50 = - 73.02 \end{array}$$
$$\begin{array}{r} +20.26 \\ -31.29 \\ \hline \end{array} \qquad \begin{array}{r} +10.62 = +13.5 \\ -18.75 = -15.7 \\ \hline \end{array}$$
$$\begin{array}{r} + 17.73 \\ + 2.53 \\ \hline \end{array} \quad \begin{array}{r} - 10.62 = - 89 \\ = + 46 \end{array}$$

$$a = \pm 18$$

MC1402

Hiron's Center Conditional Equation

16

	u	c	0-c
2	$+169 - 134 + 1 = -41$	$+31 + 1 - 22 = +10$	-51
3	$+201 - 079 + 1 = +44$	$+37 + 1 - 22 = +16$	$+28$
4	$+216 + 020 - 1 = +12$	$+39 - 0 - 22 = +17$	-5
5	$+215 + 021 + 1 = +96$	$+39 - 0 - 22 = +17$	$+79$
6	$+169 + 134 + 1 = -41$	$+31 - 1 - 22 = +8$	-49
7	$+069 + 204 + 1 = -73$	$+13 - 2 - 22 = -11$	-62
8	$000 + 216 - 1 = +16$	$+0 - 2 - 22 = -24$	$+40$
9	$-031 + 213 + 1 = -12$	$-6 - 2 - 22 = -30$	$+18$

 $-167 + 165$

Average = 41

Normal Equation

$$\begin{aligned}
 +1958 - 0.39 + 1008 &= +135 \\
 -039 + 1762 + 575 &= -154 \\
 +1008 + 575 + -800 &= +1
 \end{aligned}$$

$$\begin{aligned}
 -039 - 001 + 020 &= +3 \\
 -1008 + 020 - 519 &= -70
 \end{aligned}$$

$$\begin{aligned}
 +1761 + 595 &= -151 \\
 +595 + 281 &= -69
 \end{aligned}$$

$$\begin{aligned}
 -595 - 201 &= +51 \\
 +080 &= -18
 \end{aligned}$$

$$c = -225$$

$$\begin{aligned}
 = 1260 - 595 &= +146 \\
 +501 &= -5
 \end{aligned}$$

$$u = -1$$

$$\begin{aligned}
 +068 + 039 + 054 &= +6 \\
 -3090 - 1762 - 2450 &= -3
 \end{aligned}$$

$$\begin{aligned}
 +2026 + 1062 &= +135 \\
 -3129 - 1875 &= -157
 \end{aligned}$$

$$\begin{aligned}
 +1773 - 1062 &= -89 \\
 +253 &= +46
 \end{aligned}$$

$$c = +18$$

MC1402

$$X_0 = 18.3104$$

$$\frac{1}{2}a = +9$$

$$X = 18.3113$$

$$Y_0 = 22.7879$$

$$\frac{1}{2}b = 0$$

$$Y = 22.7879$$

From Plate Constants $X = 18.0495$ $Y_0 = 22.9058$

$$\xi = +0.0495$$

$$\log \xi = 8.69461$$

$$\cos S = 9.96025$$

$$\cos \delta = 8.50724$$

$$(x-A) = 0.22712$$

$$\eta = +0.9058$$

$$\log \tan S = 9.6456$$

$$\tan^2 S = 7.3892$$

$$\eta^2 = 4.0912$$

$$x-A = +1.69$$

$$A = 4^h 16^m 25.5^s$$

$$x_0 = 4^h 16^m 26.69^s$$

$$\text{Red} = +3.62$$

$$x' = 4 \quad 16 \quad 30.31$$

$$\log m_0 = 9.95703$$

$$\text{const} = 7.33115$$

$$(y-D) = 2.62588$$

$$y-D = +7 \quad 02.6$$

$$D = +24 \quad 01 \quad 28$$

$$S_0 = +24 \quad 08 \quad 30.6$$

$$\text{Red} = +15.7$$

$$S' = +24 \quad 08 \quad 46.3$$

N.C. 1402

$$X_0 = 183104$$

$$\begin{array}{r} 183104 \\ + 9 \\ \hline 183113 \end{array}$$

$$Y_0 = 227879$$

$$\begin{array}{r} 227879 \\ + 0 \\ \hline 227879 \end{array}$$

From Plate Constants $X = 180495$ $Y_0 = 229058$

$$\bar{S} = +0.0495$$

$$\log \bar{S} = 8.69461$$

$$\cos \bar{S} = 9.96025$$

$$\sin \bar{S} = 8.50724$$

$$(x-A) = 0.22712$$

$$x-A = T = 1.69$$

$$A = 4^h 16^m 25^s$$

$$x_0 = 4^h 16^m 26.69^s$$

$$Red = +3.12$$

$$\alpha = 4^h 16^m 30.31^s$$

$$\gamma = +0.9058$$

$$\log \tan \bar{S} = 9.6456$$

$$\bar{S} = 73892$$

$$\eta = 40912$$

$$\log m_0 = 9.95703$$

$$\bar{m} = 733115$$

$$(d-D) = 262588$$

$$S-D = +7026$$

$$D = +240128$$

$$S_0 = +240830.6$$

$$Red = +157$$

$$S = +240846.3$$

140 ~

Reduction to apth. place.

18

$$H + \alpha \quad 7^{\text{h}} \quad 08^{\text{m}} = 107^{\circ}$$

$$H \quad 2 \quad 52$$

$$\alpha \quad 4 \quad 16$$

$$G \quad 21 \quad 56$$

$$G + \alpha \quad 2 \quad 12 = 33^{\circ}$$

$$\log \cos (G + \alpha) \quad 9.9236$$

$$g \quad 1.1837$$

$$\sin \quad 9.7361$$

$$\tan S \quad 9.6515$$

$$8.8239$$

$$g' \quad 1.1073$$

$$g \quad 9.3952$$

$$f \quad +2.00$$

$$g \quad +0.25$$

$$h \quad +1.37$$

$$+3.62$$

$$S_0 \quad +24^{\circ} \quad 08' \quad 31''$$

$$\log \cos S \quad 9.9603$$

$$i \quad 0.7628$$

$$i \quad 0.7231$$

$$\log \sin S \quad 9.6117$$

$$\cos (H + \alpha) \quad 9.4659$$

$$h \quad 1.2924$$

$$\sin \quad 9.9806$$

$$\sec S \quad 0.0397$$

$$8.8239$$

$$h' \quad 0.3700$$

$$h \quad 0.1366$$

$$g' \quad +1.280$$

$$g \quad -2.35$$

$$i \quad +5.28$$

$$+1.573$$

1462

Reduction to app. place

$$S + 24^{\circ} 08' 21''$$

$$H + x \quad 7^{\circ} 08' = 107^{\circ}$$

$$H \quad 2 \quad 52$$

$$A \quad 4 \quad 16$$

$$G \quad 21 \quad 56$$

$$G + x \quad 2 \quad 12 = 33^{\circ}$$

$$\log \cos(G+x) \quad 9.9236$$

$$S_1 \quad 1.1837$$

$$\sin \quad 9.7361$$

$$\tan S \quad 9.6515$$

$$88239$$

$$g' \quad 1.1073$$

$$g \quad 9.3952$$

$$f \quad +2.00$$

$$g \quad +0.25$$

$$e \quad +1.37$$

$$+762$$

$$\log S \quad 9.7603$$

$$e \quad 0.7628$$

$$e \quad 0.7231$$

$$\log \sin S \quad 9.6117$$

$$\cos(H+x) \quad 9.9659$$

$$e \quad 1.2924$$

$$\sin \quad 9.9806$$

$$\cos S \quad 0.0397$$

$$88239$$

$$h' \quad 0.3700$$

$$h \quad 0.1366$$

$$g' \quad +1.280$$

$$g \quad -2.35$$

$$e \quad +5.28$$

$$+1573$$

$$\begin{array}{r}
 1402 \\
 \alpha = 4^{\circ} 16' 30.31'' \\
 \delta = 4^{\circ} 34' 48.3'' \\
 S - \alpha = +18' 18.0'' \\
 = +4^{\circ} 34' 30.31'' \\
 + 1' 58'' \\
 + 4' 32' 32''
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 \hline
 0.00137 \\
 9.95864
 \end{array}$$

$$\begin{array}{r}
 \gamma = 42' 16' 34'' \\
 24' 06' 46'' \\
 18' 09' 48''
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.24491 \\
 9.49377 \\
 \hline
 0.17218 \\
 7.73726
 \end{array}$$

$$S - S' = +18' 46.4''$$

$$S = +24' 27' 32.7''$$

$$\text{Hawt Allen } S = +24' 27' 26.9''$$

$$O - C = +5.8''$$

$$\text{Red tree Star } O - C = 0.0''$$

$$O - C = +5.8''$$

Lunar parallax

$$S' = +24^{\circ} 08' 46.3''$$

$$\mu = 60' 25.4''$$

$$\begin{array}{r}
 9.86913 \\
 8.24491 \\
 8.90181 \\
 \hline
 0.04083 \\
 7.05668
 \end{array}$$

$$\alpha - \alpha' = +3' 55.0''$$

$$= +15.67''$$

$$\alpha = 4^{\circ} 16' 45.98''$$

$$\alpha = 4^{\circ} 16' 45.53''$$

$$+0.45''$$

$$0.0''$$

$$+0.45''$$

1.402 Lunar parallax

$$\begin{array}{r} \alpha = 4^{\circ} 16' 30.31'' \\ \delta = 4^{\circ} 34' 48.3'' \\ \alpha - \delta = +18' 18.0'' \\ \quad + 4^{\circ} 34' 30'' \\ \quad + \quad \quad 1' 58'' \\ \quad + \quad \quad 4' 32' 32'' \end{array}$$

$$\begin{array}{r} 9.95727 \\ 0.00000 \\ \hline 0.00137 \\ 9.95864 \end{array}$$

$$\begin{array}{r} \gamma = 42' 16' 34'' \\ \quad 24' 06' 46'' \\ \quad 18' 09' 48'' \end{array}$$

$$\begin{array}{r} 9.82640 \\ 8.24491 \\ 9.49377 \\ \hline 0.17218 \\ 7.73726 \end{array}$$

$$S - S^{\perp} = +18' 40.4''$$

$$S = +24' 27' 32.9'' \quad \alpha = 4^{\circ} 16' 45.98''$$

$$\text{Hamillan } S = +24' 27' 26.9'' \quad \alpha = 4^{\circ} 16' 45.53''$$

$$O - C \quad + 5.8'' \quad + 0.45''$$

$$\text{Red cross star n.} \quad 0.0 \quad 0.0$$

$$O - C \quad + 5.8'' \quad + 0.45''$$

$$S = +24^{\circ} 08' 46.3''$$

$$\pi = 60' 25.4''$$

$$\begin{array}{r} 9.86913 \\ 8.24491 \\ 8.90181 \\ \hline 0.04083 \\ 7.05668 \end{array}$$

$$\alpha - \alpha' = +3' 55.02''$$

$$+ 15.67''$$

MC 1403 Stars - measures.

1913 June 4.

no

	α	δ	α	δ
1	1326560	9389	18350	18385
10.1	58	932732	9653	1707575
10.0	13200	2832	6060	7975
			65	90
	<u>9.9937</u>	<u>.9940</u>	<u>.1295</u>	<u>.1310</u>
2				
14.3	17272	14839	17699	16270
33.3	1451520	761210	1066269	1329805
	20	8	69	04
	80	50	00	82
	<u>3.3.2756</u>	<u>.2767</u>	<u>14.2967</u>	<u>.2971</u>
3				
31.6	10273	863226	16241	18620
16.0	983035	3835	1269597	1216165
	36	8180	8590	71
			34	38
	<u>16.0439</u>	<u>.0453</u>	<u>31.6454</u>	<u>.6465</u>

MC 1403 Stars - Measures

1913 June 4.

20

	α	δ	α	δ
1	1326860	9389	18350	18385
10.1	58	932732	9653	1707575
10.0	13200	28	6060	79
			65	90
	<u>9.9937</u>	<u>9940</u>	<u>1295</u>	<u>1310</u>
2				
143	17272	14839	17699	16270
333	1451520	760210	1066269	1329805
	20	8	69	04
	80	50	00	82
	<u>33.2756</u>	<u>2767</u>	<u>14.2967</u>	<u>2971</u>
3				
316	10273	863226	16241	18620
16.0	983035	3835	1269597	1216165
	36	8180	85-90	71
			34	38
	<u>16.0439</u>	<u>0453</u>	<u>31.6454</u>	<u>6465</u>

MC1403

Moon Measures.

1913 June 4

21

$\begin{array}{r} \text{Scratch} \\ d \\ 165-10 \\ 186 \\ 20.5 \end{array} \quad \begin{array}{r} 1194030 \\ 31 \\ 78 \\ \hline 20.4561 \end{array} \quad \begin{array}{r} N \\ 17364 \\ 11950 \\ 4748 \\ 82 \\ \hline .4574 \end{array}$

$\begin{array}{r} d \\ 17005 \\ 1322015 \\ 20 \\ 11 \end{array} \quad \begin{array}{r} N \\ 17770 \\ 11569 \\ 6065 \\ 84 \\ \hline .6214 \end{array}$

$\begin{array}{r} 2 \\ 19.0 \\ 20.8 \end{array} \quad \begin{array}{r} 18686 \\ 1015070 \\ 6257 \\ 94 \\ \hline 20.8532 \end{array} \quad \begin{array}{r} 15820 \\ 1437291 \\ 70 \\ 36 \\ \hline .8556 \end{array}$

$\begin{array}{r} 3 \\ 19.4 \\ 20.0 \end{array} \quad \begin{array}{r} 18316 \\ 12480 \\ 87 \\ 10 \\ \hline 19.4170 \end{array} \quad \begin{array}{r} 16077 \\ 1190400 \\ 90 \\ 87 \\ \hline .4186 \end{array}$

max μ = about 19.4250

$\begin{array}{r} 4 \\ 19.2 \\ 23.0 \end{array} \quad \begin{array}{r} 18251 \\ 1065452 \\ 65 \\ 57 \\ \hline 192401 \end{array} \quad \begin{array}{r} 15130 \\ 1272928 \\ 2028 \\ 39 \\ \hline .2405 \end{array}$

$\begin{array}{r} 5 \\ 19.0 \\ 23.5 \end{array} \quad \begin{array}{r} 16215 \\ 1209700 \\ 0000 \\ 20 \\ \hline 23.4118 \end{array} \quad \begin{array}{r} 18319 \\ 1243033 \\ 20 \\ 29 \\ \hline .4103 \end{array}$

$\begin{array}{r} 6 \\ 18.4 \\ 24.0 \end{array} \quad \begin{array}{r} 17077 \\ 10488 \\ 8584 \\ 65 \\ \hline 183417 \end{array} \quad \begin{array}{r} 18751 \\ 1532512 \\ 1812 \\ 64 \\ \hline .3438 \end{array}$

M1403

Moon-Measures.

1913 June 4

21

$$\begin{array}{r}
 \text{Scratch } d \\
 165-10 \\
 186 \quad 1194030 \\
 w.5 \quad 31 \\
 \quad 78 \\
 \hline
 20.4561
 \end{array}
 \qquad
 \begin{array}{r}
 N \\
 17364 \\
 11950 \\
 4748 \\
 82 \\
 \hline
 4574
 \end{array}$$

$$\begin{array}{r}
 d = \\
 17005 \\
 1322015 \\
 20 \\
 11 \\
 \hline
 18.6211
 \end{array}
 \qquad
 \begin{array}{r}
 N \\
 17770 \\
 11569 \\
 6065- \\
 84 \\
 \hline
 6214
 \end{array}$$

$$\begin{array}{r}
 2 \\
 190 \quad 18686 \\
 w.8 \quad 1015070 \\
 \quad 6257 \\
 \quad 94 \\
 \hline
 20.8532
 \end{array}
 \qquad
 \begin{array}{r}
 15820 \\
 1437291 \\
 70 \\
 36 \\
 \hline
 8556
 \end{array}$$

$$\begin{array}{r}
 3 \\
 194 \\
 210
 \end{array}$$

$$\begin{array}{r}
 18316 \\
 12480 \\
 8779 \\
 10
 \end{array}$$

$$\begin{array}{r}
 16077 \\
 1190400 \\
 90 \\
 87 \\
 \hline
 4186
 \end{array}$$

$$\begin{array}{r}
 194170
 \end{array}$$

max in μ = about 19.4250

$$\begin{array}{r}
 4 \\
 192 \\
 230
 \end{array}$$

$$\begin{array}{r}
 18251 \\
 1065452 \\
 65 \\
 57
 \end{array}$$

$$\begin{array}{r}
 192401
 \end{array}$$

$$\begin{array}{r}
 15130 \\
 1272928 \\
 2028 \\
 39 \\
 \hline
 2405
 \end{array}$$

$$\begin{array}{r}
 5 \\
 190 \quad 16215 \\
 235 \quad 1209700 \\
 \quad 00 \\
 \quad 20 \\
 \hline
 23.4118
 \end{array}
 \qquad
 \begin{array}{r}
 18319 \\
 1243033 \\
 20 \\
 29 \\
 \hline
 4103
 \end{array}$$

$$\begin{array}{r}
 6 \\
 184 \\
 240
 \end{array}$$

$$\begin{array}{r}
 17077 \\
 10488 \\
 8584 \\
 65
 \end{array}$$

$$\begin{array}{r}
 18.3417
 \end{array}$$

$$\begin{array}{r}
 18751 \\
 1532512 \\
 1812 \\
 64 \\
 \hline
 3438
 \end{array}$$

1913 June 4

22

NIC1403 Moon Measures.

	d	4	v	d	x	v
2	14870		17419			
18.0	13260	55	903031			
24.2	70		28			
	70		24			
	<u>24.1608</u>		<u>.1607</u>			

8			
17.0	18890		16380
24.3	16160	62	912020
	61		14
	00		90
	<u>24.2732</u>		<u>.2731</u>

max in y = about 24.2950

1913 June 4

22

NIC1403

Moon Measures

d 4
 $\frac{2}{150}$ 14870
 242 13260 55
 70
 70
241608

$\frac{8}{170}$ 18890
 243 16160 62
 61
 00
242732

N
 17419
 902031
 28
 24
1607

16380
 912020
 14
 90
2731

max y = about 24.2950

1403 Times etc
 inf. to stars 19.11 Nov 7 4^h 42^m - 4^h 55^m 54^s
 moon 4 48 07.0 - 4 48 07.6
 loop slow 0 43.5

H. S. d. T. 4 48 50.8
 H. h. w. g. 4 44 31.05
 C. S. d. T. 9 33 21.85
 2nd Time noon 15 02 16.84
 Interval 18 31 05.01
 Reduction 3 02.03
 G. n. T. 18 28 02.98

from bank Alm R. to Head
 noon 18^h 4^h 16^m 08.64 + 24^m 25^s 18.2
 Moon in 1^m 26.269 91.22
 2nd Cen 28.0497 + 1 13.68 + 4 15.9
 Tabular place 4^h 17^m 22.32 + 24 29 34.1
 Moon's parallax 60' 25" 5"
 Semidiam 16 29.4

ME 1403

1913 June 13.

23

Preliminary Reduction.

	1	2	3
x	10.1302	14.2969	31.6460
z	11.8047	15.6824	33.2410
$x-z$	-1.6745	-1.3855	-1.5950
y	9.9938	33.2762	16.0446
y_m	10.9413	34.2740	17.2520
$y-\eta$	-9.475	-9.978	-1.2074

Plate Constants

$x-z$	-1.2384	-2.172	+1.8003		
-1.6745	-1.237	-1.7982	-2.172	-1.8003	= 0
-1.3855	-4.119	-1.7974	-3.0	-1.8004	= -1
-1.5950	-1.987	-1.7937	-6.6	-1.8003	= 0
17.2648	-27.40	-3.6	= 18.7875		

$y - \eta$	+ 1.20.826	+ 8.251
- 9.475	+ 1.224 = - 8.251	= 0
- 9.978	+ 1.727 = - 8.251	= 0
- 1.2074	+ 3.823 = - 8.251	= 0
22.1332	+ 20.86	= 23.1669

from tables	$t+a = 0.0$	$a = -0.3$	$a = -0.3$
observed	+3.0	+2.0	0.0

1453 Times etc
 Exp to stars 1911 Nov. 7 4^h 42^m - 4^h 54^m
 " " moon 4 48 07.0^v - 4 48 07.6^v
 clock slow 0 43.5^v

H. Sid T 4 48 50.8^v
 H. Wang 4 44 31.05^v
 G. Sid T 9 33 21.85^v
 Sid Time Moon 15 02 16.84^v
 Interval 18 31 05.01^v
 Reduction 3 02.03^v
 G. M. T. 18 28 02.98^v

From Naut. Alman. R. Q. local
 Moon 18^h 4^h 16^m 08.64^v + 24^o 25' 18.2^v
 Motion in 1^m = 26.269^v 9.122^v
 + 1 13.68^v + 4 15.9^v
 Tabular place 4^h 17^m 22.32^v + 24 29 34.1^v
 Moon's parallax 60' 25.5^v
 Semidiameter 16 29.4^v

N14 1403

1913 June 13

23

Preliminary Reduction

	1	2	3
α	10.1302	14.2969	31.6460
δ	11.8047	15.6824	33.2410
$\alpha - \delta$	-1.6745	-1.3855	-1.5950
μ	9.9938	33.2762	16.0446
δ	10.9413	34.2740	17.2520
$\mu - \delta$	-9.975	-9.978	-1.2074

Plate Constants

$\alpha - \delta$	-1.2384	-2.17	+1.80
-1.6745	-1.237	-1.7982	-2.1
-1.3855	-4.119	-1.7974	-3.0
-1.5950	-1.987	-1.7937	-6.6
17.2648	-2.740	-3.6	+18.7875

$\mu - \delta$	+1.2082	+8.251
-9.975	+1.224	-8.251
-9.978	+1.727	-8.251
-1.2074	+3.523	-8.251
22.1332	+20.86	+23.1669

From tables $\delta + \alpha$	0.0	$\alpha - \delta$	-0.3	$\delta - \alpha$	0.3
Observed	+3.0		+2.0		0.0

Formation of Normals

	ab		am		bm
1	- 2.27	-	16.3	+	20.1
2	- 2.22	-	62.5	+	46.0
3	- 0.28	+	133.6	-	8.2
4	+ 1.71	+	144.0	+	63.3
5	+ 2.22	-	62.5	-	46.0
6	+ 2.02	-	21.6	-	37.3
7	+ 1.49	+	10.3	+	28.4
8	- 0.56	+	12.1	-	98.5
	+ 2.11	+	137.1	-	32.2

$$(aa) = +18.22 \quad (ab) = +10.52$$

$$(ba) = +19.03 \quad (bc) = +5.09 \quad (cm) = -1$$

pt	pos. \angle	resid.
1	141.1	+ 1.1
2	126.1	- 3.3
3	93.5	+ 3.5
4	66.4	+ 4.4
5	53.8	- 5.9
6	30.0	- 2.2
7	19.9	+ 2.6
8	353.0	+ 6

1903

Miron's Center.

1913 July 3

	x	$x - X_0$	$(x - X_0)^2$	R^2	$O - C$
1	186212	+1.3585	1.8456	4.6546	-12
2	190000	+1.7373	3.0182	4.6522	-36
3	194178	+2.1551	4.6444	4.6620	+62
4	194403	+1.9776	3.9109	4.6631	+73
5	190000	+1.7373	3.0182	4.6522	-36
6	183428	+1.0801	1.1666	4.6538	-20
7	180000	+0.7373	0.5436	4.6572	+14
8	170000	-0.2627	0.0690	4.6512	-46

mean 4.6558 -1

	y	$y - Y_0$	Oy	$(y - Y_0)^2$
1	204568	-1.6759	-1	2.8090
2	208544	-1.2783	0	1.6340
3	220000	-0.1327	0	0.0176
4	230000	+0.8673	0	0.7522
5	234110	+1.2783	0	1.6340
6	240000	+1.8673	+1	3.4872
7	247608	+2.0281	+1	4.1136
8	242732	+2.1405	+1	4.5822

Aphron's Center.

$$x_0 = 19.0 \quad y = 20.8544$$

$$23.4110$$

$$44.2654$$

$$\text{mean } y = 22.1327$$

$$y_{\text{max}} = 24.2950$$

$$R = 2.1623$$

$$x_{\text{max}} = 19.4250$$

$$x_1 = 17.2627$$

$$\text{Center } \begin{cases} X_0 = 17.2627 \\ Y_0 = 22.1327 \end{cases}$$

1903

Antenna Center

1913 July 3

	x	$x - X_0$	$(x - X_0)^2$	R^2	$O - C$
1	186212	+13555	18456	46546	-12
2	190000	+17373	30182	46522	-36
3	194178	+21551	46444	46620	+62
4	194403	+19776	39109	46631	+73
5	190000	+17373	30182	46522	-36
6	183428	+10801	11666	46538	-20
7	180000	+07373	05436	46572	+14
8	170000	-02627	00690	46512	-46
			mean	46558	-1

	y	$y - Y_0$	$O - Y$	$(y - Y_0)^2$
1	204568	-16759	-1	28090
2	208544	-12753	0	16340
3	220000	-01327	0	00176
4	230000	+08673	0	07522
5	234110	+12783	0	16340
6	240000	+18673	+1	34672
7	247608	+26281	+1	41136
8	242732	+21405	+1	45822

Antenna Center

 $x = 190$ $y = 208544$ 234110

442654

mean $y = 221327$ y - mean = 242950 $R = 21623$ Y_0 - max = 194250 $X_0 = 172627$

Center $\left\{ \begin{array}{l} X_0 = 172627 \\ Y_0 = 221327 \end{array} \right.$

AAC 1403

1913 July 3

25

Moon's Center

	a	b	c	0		c	0-c
1	+1.36	-1.68	+1	-12	+57	-17-63 = -23	+11
2	+1.74	-1.28	+1	-36	+73	-13-63 = -3	-33
3	+2.16	-0.13	+1	+62	+91	-1-63 = +27	+35
4	+1.98	+0.87	+1	+73	+83	9-63 = +29	+44
5	+1.74	+1.28	+1	-36	+73	+13-63 = +23	-59
6	+1.08	+1.87	+1	-20	+46	+19-63 = +2	-22
7	+0.74	+2.03	+1	+14	+31	+20-63 = -12	+26
8	-0.26	+2.14	+1	-46	-11	+22-63 = -52	+6

Normal Equations

+122-119

Average: 29

$$\begin{aligned}
 +18.22 + 2.11 + 10.52 &= +137 \\
 +2.11 + 19.03 + 5.09 &= -32 \\
 +10.52 + 5.09 + 8.00 &= -1
 \end{aligned}$$

$$\frac{\Delta x}{\Delta z} = -1.19$$

$$\begin{aligned}
 -2.11 - 6.24 - 1.22 &= -16 \\
 -10.52 - 1.22 - 6.09 &= -79
 \end{aligned}$$

$$\begin{aligned}
 +18.79 + 3.87 &= -48 \\
 +3.87 + 1.91 &= -80
 \end{aligned}$$

$$\frac{\Delta y}{\Delta z} = -0.44$$

$$\begin{aligned}
 -3.87 - 6.80 &= +10 \\
 +1.11 &= -70
 \end{aligned}$$

$$c = -63$$

$$\begin{aligned}
 -7.85 - 3.87 &= +162 \\
 +10.94 &= +114
 \end{aligned}$$

$$b = +10$$

$$\begin{aligned}
 -436 - 2.11 - 3.32 &= +0 \\
 -3940 - 19.03 - 29.95 &= +4
 \end{aligned}$$

$$\begin{aligned}
 +13.86 &+ 7.20 = +137 \\
 -37.29 &- 24.86 = -28
 \end{aligned}$$

$$\begin{aligned}
 -10.80 &- 7.20 = -8 \\
 +3.06 &= +129
 \end{aligned}$$

$$a = +42$$

MAG 1443

19.3 July 3

25

Dionys Cauda

C 0-6

1	+136 - 168 + 10 - 12	+57 - 17 - 63 = -23	+11
2	+174 - 128 + 10 - 36	+73 - 13 - 63 = -3	-33
3	+216 - 013 + 10 + 62	+91 + 1 - 63 = +27	+35
4	+198 + 087 + 10 + 73	+83 + 9 - 63 = +29	+44
5	+174 + 128 + 10 - 36	+73 + 13 - 63 = +23	-59
6	+108 + 187 + 10 - 20	+46 + 19 - 63 = +2	-22
7	+074 + 203 + 10 + 14	+31 + 20 - 63 = -12	+26
8	-026 + 214 + 10 - 46	-11 + 22 - 63 = -52	+6

Normal Equation

+122 - 119

Average: 29

$$\begin{aligned}
 +18.22 + 211 + 10.52 &= +137 \\
 + 2.11 + 1903 + 509 &= -32 \\
 + 10.52 + 509 + 800 &= -1
 \end{aligned}$$

$$\begin{aligned}
 - 2.11 - 024 - 122 &= -16 \\
 - 10.52 - 122 - 609 &= -79
 \end{aligned}$$

$$\begin{aligned}
 + 18.79 + 387 &= -48 \\
 + 387 + 191 &= 80 \\
 - 387 - 0.80 + 10 &= 10 \\
 + 111 &= 70
 \end{aligned}$$

$$C = -63$$

$$\begin{aligned}
 - 785 - 387 &= +162 \\
 + 1094 &= +114
 \end{aligned}$$

$$A = +10$$

$$\begin{aligned}
 - 436 - 211 - 332 &= +0 \\
 - 3940 - 1903 - 2995 &= +9
 \end{aligned}$$

$$\begin{aligned}
 + 1386 &+ 720 = +137 \\
 - 3729 &- 2486 = -28
 \end{aligned}$$

$$\begin{aligned}
 - 1080 &- 720 = -8 \\
 + 306 &= +129
 \end{aligned}$$

$$a = +42$$

MC 1903

1913 July 5

Moon's Mean position (1911.0)

$$\begin{array}{r} Y_0 = 172627 \\ \frac{1}{2}a = +21 \\ \hline 172648 \end{array}$$

$$\begin{array}{r} Y_0 = 221327 \\ \frac{1}{2}b = +5 \\ \hline 221332 \end{array}$$

From Plate Constants $X = 18.7875$ $Y = 23.1669$

$$\begin{array}{l} \xi = +0.7875 \\ \log \xi = 9.89625 \\ \cos \delta = 9.96014 \\ \text{const} = 8.50724 \end{array}$$

$$\begin{array}{l} \eta = +1.1669 \\ \log \tan \delta = 9.6486 \\ \log \xi^2 = 9.7925 \\ \eta_+ = 6.4945 \end{array}$$

$$\text{"} (\delta - A) \text{"} = 1.42887$$

$$(\delta - A) = +26.85 \quad \eta_1 = +3$$

$$A = 4 \ 16 \ 25 \quad \eta_0 = +1.1666$$

$$\begin{array}{l} \alpha_0 = 4 \ 16 \ 51.85 \\ \log \eta_0 = 0.06692 \\ \text{const} = 7.33115 \end{array}$$

$$\text{Red} = +3.62 \quad (\delta - D) = 2.73577$$

$$\delta = 4 \ 16 \ 55.47 \quad \delta - D = +09 \ 04.2$$

$$D = +24 \ 01 \ 28$$

$$\delta_0 = +24^\circ \ 10' \ 32.2''$$

$$\text{Red} = +15.7$$

$$S' = +24 \ 10 \ 47.9$$

M = 1903

1913 July 5

Mean Right Ascension 1911.0

$$\begin{array}{r}
 Y_0 = 172627 \\
 + 21 \\
 \hline
 172648
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 221327 \\
 + 5 \\
 \hline
 221332
 \end{array}$$

From Plate Constants $X = 18.7875$ $Y = 23.1669$

$$Z = +0.7875$$

$$\eta = +1.1669$$

$$\log S = 9.89625$$

$$\cos S = 9.96014$$

$$\cos \delta = 8.50724$$

$$\log \tan S = 9.6486$$

$$\log \eta = 9.7925$$

$$\eta_+ = 6.4945$$

$$(X-A) = 1.2887$$

$$(X-A) = +2.655$$

$$\eta_1 = +3$$

$$\eta_0 = +1.1666$$

$$A = 9.1625$$

$$\log \eta_0 = 0.06692$$

$$X_0 = 4.165185$$

$$\cos \eta = 7.33115$$

$$Red = +3.62$$

$$(S-D) = 27.3577$$

$$V = 4.165547$$

$$S-D = +0.9042$$

$$D = +24.0128$$

$$S_0 = +24^{\circ} 10' 32''$$

$$Red = +1.57$$

$$S = +24.10479$$

1403

Red ad locum aph.

$$S = +24^{\circ} 10' 32''$$

$$H + \alpha \quad 7^{\circ} 08' = 107^{\circ}$$

$$H \quad 2 \quad 51$$

$$\alpha \quad 4 \quad 17$$

$$G \quad 21 \quad 56$$

$$G + \alpha \quad 2 \quad 13 = 33^{\circ} 15'$$

$$l \cos S \quad 9.9601$$

$$i \quad 0.7617$$

$$(i) \quad 0.7218$$

$$l \sin S \quad 9.6123$$

$$\cos(H + \alpha) \quad 9.4659^m$$

$$h \quad 1.2925^m$$

$$\sin \dots \quad 9.9806$$

$$\sec S \quad 0.0399$$

$$8.8239$$

$$l \cos(G + \alpha) \quad 9.9229$$

$$g \quad 1.1840$$

$$\sin \dots \quad 9.7390$$

$$\tan S \quad 9.6521$$

$$8.8239$$

$$8' \quad 1.1064$$

$$8 \quad 9.3990$$

$$h' \quad 0.3707^m$$

$$h \quad 0.1369$$

$$b \quad +2.00$$

$$8 \quad +0.25$$

$$h \quad +1.37$$

$$+3.62^{\circ}$$

$$8' \quad +12.78$$

$$8 \quad -2.35$$

$$i \quad +5.27$$

$$+15.70^{\circ}$$

1403

Red ad locum alt

$$S = +24^{\circ} 10' 32''$$

$$H + \alpha \quad 7^{\circ} 08' = 107^{\circ}$$

$$H \quad 2 \quad 51$$

$$\alpha \quad 4 \quad 17$$

$$G \quad 21 \quad 56$$

$$G + \alpha \quad 2 \quad 13 = 33^{\circ} 15'$$

$$\log S \quad 9.4601$$

$$i \quad 0.7617$$

$$(i) \quad 0.7218$$

$$\log (G + \alpha) \quad 9.9229$$

$$g \quad 1.1840$$

$$\log \quad 9.7390$$

$$\log S \quad 9.6521$$

$$8.8239$$

$$8 \quad 1.1064$$

$$8 \quad 9.3990$$

$$b \quad +2.00$$

$$8 \quad +0.25$$

$$i \quad +1.37$$

$$+3.62$$

$$\log S \quad 9.6123$$

$$\log (H + \alpha) \quad 9.4659$$

$$h \quad 1.2925$$

$$\log \quad 9.9806$$

$$\log S \quad 0.0399$$

$$8.8239$$

$$b' \quad 0.3707$$

$$h \quad 0.1369$$

$$b' \quad +1.278$$

$$h' \quad -2.35$$

$$i \quad +5.27$$

$$+15.70$$

1403

Lunar Parallax.

$$\alpha' = 4^{\circ} 16' 55.47''$$

$$\theta = 4 \quad 48 \quad 50.8''$$

$$+ 31 \quad 55.33''$$

$$+ 7^{\circ} 58' 50''$$

$$+ \quad \quad 3 \quad 25''$$

$$+ 7 \quad 55 \quad 25''$$

$$9.95727$$

$$0.00000$$

$$0.00417$$

$$\hline 9.96144$$

$$\gamma = 42 \quad 27 \quad 35''$$

$$24 \quad 10 \quad 48$$

$$18 \quad 16 \quad 47$$

$$9.82640$$

$$8.24492$$

$$9.49646$$

$$0.17065$$

$$\hline 7.73843$$

$$\delta - \delta' = +18 \quad 49.4''$$

$$\delta = +24 \quad 29 \quad 37.3''$$

$$\alpha = 4 \quad 17 \quad 22.75''$$

$$\text{Hartmann } \delta = +24 \quad 29 \quad 34.1''$$

$$\alpha = 4 \quad 17 \quad 22.32''$$

O-C

$$+ 3.2''$$

$$+ 0.43''$$

Red to standard

$$+ 0.1''$$

$$+ 0.02''$$

O-C

$$+ 3.3''$$

$$+ 0.45''$$

1403

Lunar Parallaxes

$$\alpha = 4^{\circ} 16' 55.47''$$

$$\delta = 4^{\circ} 48' 50.8''$$

$$+ 31' 55.33''$$

$$+ 7^{\circ} 58' 50''$$

$$+ 3' 25''$$

$$+ 7' 55' 25''$$

$$995727$$

$$000000$$

$$000417$$

$$996144$$

$$\gamma = 42^{\circ} 27' 35''$$

$$24^{\circ} 10' 48''$$

$$18^{\circ} 16' 47''$$

$$982640$$

$$824492$$

$$949646$$

$$017065$$

$$773843$$

$$\delta - \delta = +18' 49.4''$$

$$\delta = +24^{\circ} 29' 37.3''$$

$$\text{Hawkins } \delta = +24^{\circ} 29' 34.1''$$

$$O-C + 3.2''$$

$$\text{Red Star } + 0.1''$$

$$O-C + 3.3''$$

$$S = +24^{\circ} 10' 47.9''$$

$$\pi = 60' 25.5''$$

$$986913$$

$$824492$$

$$914251$$

$$004095$$

$$729751$$

$$\alpha - \alpha = +6' 49.20''$$

$$= +27.28''$$

$$\alpha = 4^{\circ} 17' 22.75''$$

$$\alpha = 4^{\circ} 17' 22.32''$$

$$+0.43''$$

$$+0.02''$$

$$+0.45''$$

