1911ApJ...33..347M

KG
11366
v.580

IV
933
347
667

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Harvard Lunar Plates.

Measures and Reductions,

Mary Fowler.

Volumes IV

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MC 933

Standard coordinates.

	Star 1	2	3
α	14h 25m 21.53	14h 27m 02.91	14 35 13.13
A	14 32 32	14 32 32	14 32 32
α−A	− 7 10.47	− 5 29.09	+ 2 41.13
Sin(α−A)	− 430.40	− 329.06	+ 161.13
log "	2.633876n	2.517286n	2.207188
" cos δ	9.985249	9.982911	9.983249
" ξ₀	1.12635n	1.00743n	0.69766
ξ₀	−133767	−10.1726	+49849
ξ₁	− 65	− 29	+ 4
ξ	31.8832	28.1755	13.0147
x	31.4302	28.3447	13.1686
x−ξ	− 470	− 1692	− 1539

Signs of x + y changed

δ	−14 51 14.8	−15 58 05.9	−15 49 03.1
D	−15 29 37	−15 29 37	−15 29 37
δ−D	+ 38 22.2	− 28 28.9	− 19 26.1
Tan(δ−D)	+ 23023	− 1708.9	− 1166.1
log "	3.362166	3.232722n	3.066749n
" η₀	0.69331	0.56387n	0.39789n
" tan δ	9.42366n	9.45666n	9.45224n
" ξ²	2.2527	2.0149	1.3953
" η₁	8.7297n	8.5249n	7.9009n
η₀	+4.9352	−3.6632	−2.4997
η₁	− 537	− 335	− 80
η	17.1185	25.6967	24.5077
y	16.9116	25.5302	24.5584
y−η	+ 2069	+ 1665	− 507

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MC 933 1912 Oct 31.

Standard coordinates.

	Star 1	2	3
α	$14^h\ 25^m\ 21^s.53$	$14^h\ 27^m\ 02^s.91$	14 35 13.13
A	14 32 29	14 32 29	14 32 29
x-A	− 7 07.47	− 5 26.09	+ 2 44.13
m(x-A)	− 427.40	− 326.06	+ 164 1.3
log"	2.630837m	2.513305m	2.215 19
· cosδ	9.98524	9.98291	9.98324
ξ₀	1.12331m	1.00345m	0.70567
ξ₀	− 13.2834	− 10.0798	+ 5.0778
ξ₁	− 62	− 28	+ 4
ξ	31.2896	28.0826	12.9218
x	31.4302	28.3447	12.4473
x-ξ	− 1406	− 2621	+ 4745

signs of x + y changed.

δ	−14 51 14.8	−15 58 05.9	−15 49 03.1
D	−15 29 28.	−15 29 28	−15 29 28.
δ-D	+ 38 13.2	− 28 37.9	− 19 35.1
m(δ-D)	+ 2293.3	− 1717.9	− 1175.1
log"	3.360 46	3.234 99m	3.070 08m
· η₀	0.69161	0.56614m	0.40123m
· tanδ	9.42236m	9.45666m	9.45224
· ξ²	2.2466	2.0069	1.4113
η₁	8.72236m	8.51669m	7.91669m
η₀	+ 4.91600	− 3.68225	− 2.51900
η₁	− 529	− 329	− 83
η	17.13369	25.71554	24.52773
y	16.91116	25.53302	24.63088
y-η	+ .22253	+ .18252	− 1035

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MC 933.

Star	4	5
α	$14^h\ 36^m\ 00^s.32$	$14^h\ 36^m\ 36^s.50$
A	14 32 32	14 32 32
$\alpha - A$	+ 3 28 32	+ 4 04 50
$\sin(\alpha - A)$	+ 208.31	+ 244.49
log "	2.318711	2.388226
" cos δ	9.998507	9.998675
" ξ_0	0.81702	0.88225
ξ_0	+6.47717	+7.62528
ξ_1	+ 10	+ 33
ξ	11.52733	10.37115
x	11.5856	10.3368
$x - \xi$	− 583	+ 347

δ	$-14^\circ\ 56'\ 16''.3$	$-14^\circ\ 04'\ 55''.2$
D	−15 29 37	−15 29 37
$\delta - D$	+ 33 20.7	+ 1 24 41.8
$\sin(\delta - D)$	+ 2000.8	+ 5082.8
log "	3.301211	3.706101
" η_0	0.63236	1.03725
" tan δ	9.42622$_m$	9.39944$_m$
" ξ'	16220	17645
" η_1	8.10163$_m$	8.21733$_m$
η_0	+42890	+10.8955
η_1	− 126	− 131
η	17.72326	11.11176
η	17.80191	11.21910
$\eta - \eta$	− 783	− 1014
		− 165
		11.12100
		11.21900
		− 980

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MC 933.

Star	4	5
α	$14^h\ 36^m\ 00^s.32$	$14^h\ 36^m\ 36^s.50$
A	14 32 29	14 32 29
$\alpha - A$	+ 3 31.32	+ 4 07.50
$\cos(\alpha - A)$	+ 211.31	+ 247.49
log	2.32492	2.39356
cos	9.99507	9.98675
		0.88755
δ_0	0.81723	
δ_0	+6.56650	+7.71188
δ_1	+ 10	+ 24
δ	1.14340	10.27788
α	11.58516	10.33688
$\alpha - \delta$	− 1516	− 590

δ	$-14^\circ\ 56'\ 16''.3$	$-14^\circ\ 04'\ 55''.2$
D	−15 29 28	−15 29 28
$\delta - D$	+ 33 11.7	+ 1 24 32.8
$\sin(\delta - D)$	+ 1991.8	+ 5073.8
log	3.29925	3.70533
η_0	0.63040	1.03648
$\tan\delta$	9.42622n	9.39944n
δ''	1.63445	1.77511
η_1	8.11411n	8.22794n
η_0	+4.26977	+10.87622
η_1	− 130	− 169
η	17.74433	11.14407
η	17.80119	11.21990
$\eta - \eta$	+ 586	− 783

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Comparison stars - measures.

	4 d	4 r	∝ d	∝ r
V				
31.5	16010	15028	15990	16242
16.9	68882	14138	10290	11945
	84	40	98	48
	10	38	02	68
	16.9122	16.9110	31.4301	31.4302
R				
28.4	15430	14250	15240	15881
25.5	10122	9548	8693	12446
	30	50	00	45
	37	60	51	04
	25.5308	25.5296	28.3449	28.3445
S	16623	14282	15777	15981
12.4	10310	10586	2562	11505
24.6	12	92	59	12
	19	86	88	82
	24.6311	24.6305	12.4474	.4472
V				
11.6	15562	15613	15272	15255
17.8	75485	13635	11135	93789
	48	30	37	90
	70	15	94	50
	17.8019	.8019	11.5854	.5858
S	15402	13609	14971	15047
10.4	13218	5807	8354	12682
11.2	15	01	59	86
	18	09	95	58
	11.2187	.2193	10.3370	.3367
V				
13.2	15732	15964	15476	14909
24.5	10145	11539	71646	13215
	40	40	61	19
	28	54	84	12
	24.5586	.5582	13,1681	.1691

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Comparison stars - measures.

	α	n	α	n
4				
V				
31.5	16010	15028	15990	16242
16.9	68888 92	14138 38	10290 98	11945 49
	84	40	98	48
	10	38	02	68
	16.9122	16.9110	31.4301	31.4302
2				
28.4	15430	14250	15240	15881
25.5	10122 25	9548 56	8693 98	12446 40
	30	50	00	45
	37	60	51	04
	25.5308	25.5296	28.3449	28.3445
3	16623	14282	15777	15981
12.4	10310 08	10586 88	12456 58	11505 10
24.6	12	92	59	12
	19	86	88	82
	24.6311	24.6305	12.4474	.4472
4				
11.6	15562	15613	15272	15255
17.8	7548 51	13635 31	11135 34	9378 90
	48	30	37	90
	70	15	94	50
	17.8019	.8019	11.5854	.5858
5	15402	13609	14971	15047
10.4	13218 21	5807 97	8354 57	12682 85
11.2	15	01	59	86
	18	09	95	58
	11.2187	.2193	10.3370	.3367
	15732	15964	15476	14909
	10145 46	11539 45	7.16467	13215 20
	40	40	61	19
	28	54	84	12
	24.5586	.5582	13,1681	.1691

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MC 933 1912 Oct 24. 4

Mean measured coörds of comp. Stars.
Coörds of Plate center.

Star	x	y
1	31.4302	16.9116
2	28.3447	25.5302
3	13.1686	24.5584
4	11.5856	17.8019
5	10.3368	11.2190
	5 | 94.87	9602
	18.95	19.20
	+ 31	- 2.80
	95	465
	285	1302.00
	+ 29.45	- 21′ 42″

mean R.A. = $14^h\ 32^m\ 03^s$
$+\quad\quad 29^s$
A = 14 32 32

mean Decl = $-15^\circ\ 07'\ 55''$
$-\quad\quad 21'\ 42$
D = −15 29 37

1912 Nov. 7.

Preliminary Reduction.

Star	x − 3 + 1414	+ x	− 1939
1	−470 + 2384 = +1914	+31 = +1945	= +6
2	−1692 + 3600 = +1908	+28 = +1936	= −3
3	−1539 + 3463 = +1924	+13 = +1937	= −2
4	−583 + 2510 = +1927	+12 = +1939	= 0
5	+347 + 1582 = +1929	+10 = +1939	= 0
mean	18.8699 + 3082	+ 19	= 18.7557
	+ 3087		= −18.7592

Star	y − 7 − 146x	− 64	+ 2599
1	+2069 − 4588 = −2519	−101 = −2620	= −21
2	+1665 − 4138 = −2473	−153 = −2626	= −27
3	−507 − 1923 = −2430	−147 = −2577	= +22
4	−783 − 1693 = −2476	−107 = −2583	= +16
5	−1014 − 1510 = −2524	−67 = −2591	= +8
mean	−21.8631 − 2755	− 131 =	= 21.8918

Star	− 144x	− 44	+ 2516
1	+2069 − 4526 = −2457	−68 = −2525	= −9
2	+1665 − 4082 = −2417	−102 = −2519	= −3
3	−507 − 1896 = −2403	−98 = −2501	= +15
4	−783 − 1668 = −2451	−71 = −2522	= −6
5	−980 − 1488 = −2468	−45 = −2513	= +3
mean	−21.8631 − 2717 =	− 87	= 21.8919

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MC 933 1912 Oct 24. 4

Means Measured Coords of Comp. Stars.
Coords of Plate center.

Star	x	y
1	31.4302	16.9116
2	28.3447	25.5302
3	12.4473	24.6308
4	11.5856	17.8019
5	10.3368	11.2190
	5)9914	9609
	1983	1922
	+ 31	- 279
	83	465
	249	1292.70
	+ 25.78	- 21' 33

Mean R.A.: $14^h\ 32^m\ 03^s$
$+\ 26^s$
$A = 14\ 32\ 29$

Mean Decl: $-15^\circ\ 07'\ 55''$
$-\ 21'\ 33''$
$D = -15\ 29\ 28$

1912 Nov. 7.

Preliminary Reduction.

Star	x − 3	+ 1414		+ x		− 1939
1	−470	+ 2384	= + 1914	+ 31	= + 1945	= + 6
2	−1692	+ 3600	= + 1908	+ 28	= + 1936	= − 3
3	−1539	+ 3463	= + 1924	+ 13	= + 1937	= − 2
4	−583	+ 2510	= + 1127	+ 12	= + 1939	= 0
5	+ 347	+ 1582	= + 1929	+ 10	= + 1939	= 0
mean	−18.8699	+ 3082		+ 19		= 18.7537

	y − 7	− 146x		− 64		+ 2599
1	+ 2069	− 4588	= − 2519	− 101	= − 2620	= − 21
2	+ 1665	− 4139	= − 2473	− 153	= − 2626	= − 27
3	− 507	− 1923	= − 2430	− 147	= − 2577	= + 22
4	− 783	− 1693	= − 2476	− 107	= − 2583	= + 16
5	− 1014	− 1510	= − 2524	− 67	= − 2591	= + 8
mean	−21.8631	− 2755		− 131	=	= 21.8948

		− 144x		− 44		+ 2516
1	+ 2069	− 4526	= − 2457	− 68	= − 2525	= − 9
2	+ 1665	− 4082	= − 2417	− 102	= − 2519	= − 3
3	− 507	− 1896	= − 2409	− 98	= − 2501	= + 15
4	− 783	− 1668	= − 2451	− 71	= − 2522	= − 6
5	− 980	− 1488	= − 2468	− 45	= − 2513	= + 3

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MC933. 1912 Oct 24. 5

Points on moon's limb. measures.

4

V (1)	d	N
19.0	17740	15612
E3.7	9788880	13554451
	8489	4662
	44	21
	23.7958	.7939
2 (3)		
18.0	16868	13925
23.5	10940027	9841552
	2744	3556
	72	34
	23.5936	.5917
3 (5)		
17.0	15651	14091
22.4	11978666	7802880
	7134	9195
	51	97
	22.3689	.3698
4 (8)		
17.0	16250	16428
21.4	12788898	9990884
	0200	0170
	58	32
	21.3456	.3555
5 (10)		
18.0	14361	15629
20.2	12991982	6964500
	9596	5062
	71	32
	20.1368	.1324
6 (4)		
17.4		13811
E3.0		6831826
		2736
		11
		17.3019

15203
12164554
6256
14
.3047

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MC 933. 1912 Oct 24.

Points on Moon's Limb. Measures.

	d	N
1		
19.0	17740	15612
23.7	9788880	1355451
	8489	4662
	44	21
	23.7958	.7939
2		
18.0	16868	13925
23.5	10940827	984152
	2749	3556
	72	34
	23.5936	.5917
3		
17.0	15651	14091
22.4	11978866	7802880
	7139	9195
	51	97
	22.3689	.3698
4		
17.0	16250	16428
21.4	12788898	9990884
	02800	0170
	58	32
	21.3456	.3555
5		
18.0	14361	15629
20.2	12991982	6964500
	9596	5062
	71	32
	20.1368	.1324
6		
17.4		13811
23.0		6831826
		9736
		11
		17.3019

	15203
	12164 54
	62 56
	14
	.3047

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Measures on Moon's limb continued.

x

	d	N
x (6)		
16.9	16589	15782
22.0	15982 76	63847 8
	7844	8181
	09	98
	16.9388	.9416
8 (9)		
17.2	16422	15544
21.0	78600 1	14161 54
	8898	6867
	41	62
	17.1359	.1384
9 (7)		
16.8	14021	14791
21.9	13368 48	54424 6
minim x	5854	4358
	40	02
	16.9335	.9354
10 (2)		
18.8	15654	14602
23.7	76746 8	12547 62
matu	6275	4764
4	59	12
	23.7989	.7949

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Measures on Uranus limb continued.

	d	N
γ		
16.9	16589	15782
22.0	15982 76	6384 78
	7844.	8181
	09	98
	16.9388	.9416
δ		
17.2	16422	15544
21.0	7800 01	14161 54
	8898	6867
	41	62
	17.1359	.1384
ε		
16.8	14021	14791
21.9	13368 48	5442 46
minimum x	5854	4358
	40	02
	16.9335	.9354

ζ		
18.8	15654	14602
23.7	7674 68	12547 62
maximum	6275	4764
x	59	12
	23.7989	.7949

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MC933 1912 Oct 25. 7

Transits etc

Exp. to stars	1911 Feb. 18	14h	16m	0s	-14	25 00
" " moon		14	20	31.2		20 31.5
clock fast						2 32.4
Harvard Sid J.		14	17	58.95		
" long		4	44	31.05		
Gr. Sid J.		19	02	30.00		
Sid. J. M. noon		21	49	19.29		
Sid. Interval		21	13	10.71		
Reduction			3	28.58		
Gr. M. J.		21	09	42.13		

		R.A.			Decl.		
Moon's Ap. Eph.							
Moon	21h	14h	31	38.34	-14	40	45.7
motion in 1m =		1s.9060			+11".948		
" " 9.702		+		18.49	-	1	55.8
Tabular place		14	31	56.83	-14	42	41.5

Moon's parallax 54' 41".8
" semid. 14' 55.8

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Mc 933 1912 Oct 25. 7

Times etc

Exp. to stars	1911 Feb. 18	14h	16m	0s -14 25 00
" " moon		14	20	31.2 20 31.5
clock fast				2 32A
Harvard Sid J.		14	17	58.95
" long		4	44	31.05
Gr. Sid. J.		19	02	30.00
Sid. J. M. moon		21	49	19.29
Sid. Interval		21	13	10.71
Reduction			3	28.58
Gr. M. T.		21	09	42.13

Lunar Am Eph.			Pos. R.A.			Decl.		
Moon	21h	14m	31	38.34	-14	40	45.7	
motion in 1m =			1.9062		+11.986			
" " 970	+		1849"		-	1	55.8	
Tabular place	14	31	56.83		14	42	41.5	

Moon's parallax 54' 42".5
" semid. 14' 56".1

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Prob x = 16.2

Prob y = 9.7

Read in 4

			C	O	O − C
− 25	+ 21	− 9	− 13	− 9	+ 4
− 22	+ 32	− 9	+ 1	− 3	− 4
− 10	+ 31	− 9	+ 12	+ 15	+ 3
− 9	+ 23	− 9	+ 5	− 6	− 11
− 8	+ 15	− 9	− 2	+ 3	+ 5

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MC 933 1912 Nov. 7 8

Comp. Stars Reduction

Equations of condition.

Star			x − 5	4 − 7	
1	+31.43a	+16.91 + c	= +6	−21	−9
2	+28.34	+25.53 + c	= −3	−27	−3
3	+13.17	+24.56 + c	= −2	+22	+15
4	+11.59	+17.80 + c	= 0	+16	−6
5	+10.34	+11.22 + c	= 0	+8	+3

Mean Equations

+29.88a	+21.22b + c	= +1.50	−24.00	−6.00
+11.70	+17.86 + c	= −0.67	+15.33	+4.00
+20.76	+25.04 + c	= −2.50	−2.50	+6.00
+17.79	+15.31 + c	= +2.00	+1.00	−4.00
+18.18	+5.36	= +2.17	−39.33	−10.00
+2.97	+9.73	= −4.50	−3.50	+10.00
+2.97	+0.55	= +0.35	−6.41	−1.63
	+9.18b	= −4.85	+2.91	+11.63
	b	= −0.53	+0.32	+1.27
+18.18a	= +2.17 + 1.78	= +3.95	~~−39.33 = −1.08 = −40.41~~	
	a	= +0.22	a = ~~−2.22~~ −0.79	

+1.63

+1.5	−0.7	−2.5	+2.0	−24.0	+15.3	−2.5	+1.0
−6.6	−2.6	−4.6	−3.9	+68.4	+26.0	+46.0	+39.5
+11.7	+9.5	+13.3	+8.1	−6.8	−5.7	−8.0	−5.0
+6.1	+6.2	+6.2	+6.2	+35.6	+35.6	+35.5	+35.5

c for x − 5 c for 4 − 7 = −9.4

Star Resids for x. (O−C)

1	+7 −9	+6 =	+4	+6	+2
2	+6 −14	+6 =	−2	−3	−1
3	+3 −13	+6 =	−4	−2	+2
4	+3 −9	+6 =	0	0	0
5	+2 −6	+6 =	+2	0	−2

in 4. c O O−C

1	−70	+5 +36 =	−29	−21	+8
2	−63	+8 +36 =	−19	−27	−8
3	−29	+8 +36 =	+15	+22	+7
4	−26	+6 +36 =	+16	+16	0
5	−23	+4 +36 =	+17	+8	−9

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Comp. Star Reduction.

Equations of condition.

Star				x-5	y-7	
1	+31.43a	+16.91	+c	= +6	−21	−9
2	+28.34	+25.53	+c	= −3	+27	−3
3	+15.17	+24.56	+c	= −2	+22	+15
4	+11.59	+17.80	+c	= 0	+16	−6
5	+10.34	+11.22	+c	= 0	+8	+3

Mean Equations

+29.88a	+21.22b	+c	= +1.50	−24.00	−6.00
+11.70	+17.86	+c	= −0.67	+15.33	+4.00
+20.76	+25.04	+c	= −2.50	−2.50	+6.00
+17.79	+15.31	+c	= +2.00	+1.00	−4.00
+18.18	+3.36		= +2.17	−39.33	−10.00
+2.97	+9.73		= −4.50	−3.50	+10.00
+2.97	+0.55		= +0.35	−6.41	−1.63
	+9.18b		= −4.85	+8.91	+11.63
	b		= −0.53	+0.32	+1.27
+18.18a	= +2.17	+1.78	= +3.95	~~3.35 = 1.08 = 4.43~~	
	a		= +0.22	a = ~~−2.22~~ −0.79	

+1.63

+1.5	−0.7	−2.5	+2.0	−24.0	+15.3	−2.5	+1.0
−6.6	−2.6	−4.6	−3.9	+66.4	+26.0	+46.0	+39.5
+11.7	+9.5	+13.3	+8.1	−6.8	−5.7	−8.0	−5.0
+6.1	+6.2	+6.2	+6.2	+35.6	+35.6	+35.5	+35.5

c for x-5 c for y-7 = −9.4

Residuals in x. (O−C)

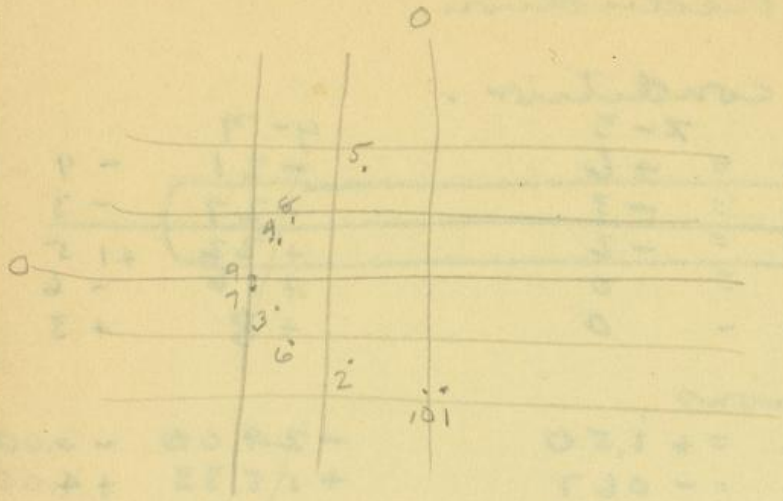
Star						
1	+7	−9	+6	= +4	+6	+2
2	+6	−14	+6	= −2	−3	−1
3	+3	−13	+6	= −4	−2	+2
4	+3	−9	+6	= 0	0	0
5	+2	−6	+6	= +2	0	−2

in y. C O O−C

1	−70	+5	+36	= −29	−21	+8
2	−63	+8	+36	= −19	−27	−8
3	−29	+8	+36	= +15	+22	+7
4	−26	+6	+36	= +16	+16	0
5	−23	+4	+36	= +17	+8	−9

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Point	Pos ∠	Residuals
1	184.0	+38
10	180.0	−51
2	153.3	+26
6	127.0	−8
3	105.1	+34
7	94.0	−74
9	90.0	−36
4	74.9	+98
8	63.4	−16
5	−26.6	−10

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Moon's center.

Point	x	x − X_0	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O−C
1	19.00000	− 0.13223	+ 1	0.01755	3.75255	+85
2	18.00000	+ 0.86777	+ 1	0.75331	3.74700	+30
3	17.00000	+ 1.86777	+ 0	3.48833	3.74455	+ 5
4	17.00000	+ 1.86777	− 0	3.48833	3.75119	+79
5	18.00000	+ 0.86777	− 1	0.75277	3.74666	+26
6	17.30333	+ 1.56444	+ 1	2.44777	3.74111	− 29
7	16.94025	+ 1.92755	+ 0	3.71552	3.73338	−102
8	17.13725	+ 1.73055	− 0	2.99466	3.74144	− 26
9	16.93444	+ 1.93333	0	3.73777	3.73777	− 63
10	18.86777	0.00000	+ 1	0.00000	3.74430	− 10
					3.74405	− 5

	y	y − Y_0	Δy	$(y-Y_0)^2$
1	23.79488	− 1.93312	− 14	3.73506
2	23.59266	− 1.72790	− 13	2.99396
3	22.36944	− 0.50458	− 4	0.25626
4	21.35066	+ 0.51302	+ 4	0.26366
5	20.13466	+ 1.72902	+ 13	2.99396
6	23.00000	− 1.13636	− 8	1.29134
7	22.00000	− 0.13636	− 1	0.01866
8	21.00066	+ 0.86636	+ 6	0.74688
9	21.86636	0.00000	0	0.00000
10	23.79969	− 1.93333	− 14	3.74300

Signs changed because of rescan.

Approximate center of moon.

x = 18.0 y = 23.59266
y = 20.13466
43.72732
mean Y = 21.86366 = adopt
max in y: 23.79969
R = 1.93333

min in x: 16.93444
X_0 = 18.86777

x = 17.00000 y = 22.36944
x = 17 y = 21.35066
43.72010
mean Y = 21.86005

Adopt as center { X_0 = 18.86777 / Y_0 = 21.86366

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Moore center

Point	x	$x - X_0$	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O-C
1	19.0006	−0.1323	+1	0.0175	3.7525	+85
2	18.0000	+0.6677	+1	0.7531	3.7470	+30
3	17.0000	+1.6677	+0	3.4883	3.7445	+5
4	17.0000	+1.6677	−0	3.4883	3.7519	+79
5	18.0000	+0.6677	−1	0.7527	3.7466	+26
6	17.3033	+1.5644	+1	2.4477	3.7411	−29
7	16.9402	+1.9275	+0	3.7152	3.7338	−102
8	17.1372	+1.7305	−0	2.9946	3.7414	−26
9	16.9349	+1.9328	−0	3.7377	3.7377	−63
10	18.8677	0.0000	+1	0.0000	3.7430	−10
					3.7440	−5

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	23.7948	−1.9312	−14	3.7350
2	23.5926	−1.7290	−13	2.9939
3	22.3694	−0.5058	−4	0.2562
4	21.3506	+0.5130	+4	0.2636
5	20.1346	+1.7290	+13	2.9939
6	23.0000	−1.1364	−8	1.2934
7	22.0000	−0.1364	−1	0.0186
8	21.0000	+0.8636	+6	0.7468
9	21.8636	0.0000	0	0.0000
10	23.7969	−1.9333	−14	3.7430

Signs changed the course of Reduction

Approximate Centre of Moore.

x = 18.0 y = 23.5926
y = 20.1346
43.7272
mean Y = 21.8636
max y = 23.7969
R = 1.9333
min x = 16.9394
X_0 = 18.8677

x = 17.0000 y = 22.3694
x = 17 y = 21.3506
43.7200
mean Y = 21.8600

Adopt as center { X_0 = 18.8677, Y_0 = 21.8636

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No	ab	ac	bc
1	+ 0.25	- 11.0	- 164.0
2	- 1.51	+ 26.1	- 51.9
3	- 0.95	+ 9.4	- 2.5
4	+ 0.95	+147.7	+ 40.3
5	+ 1.51	+ 22.6	+ 45.0
6	- 1.78	- 45.2	+ 33.1
7	- 0.27	-196.9	+ 14.3
8	+ 1.49	- 45.0	- 22.4
9	0.00	-121.6	0.0
10	0.00	0.0	+ 19.3
	-0.31	-213.9	- 88.8

$[aa] = +21.40$ $[bb] = +16.03$

$[ac] = +12.50$ $[bc] = -4.28$ $[cc] = -5$

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Moon's centre

Conditional Equations.

	a	b	c	O	Resids	C	O − C
1	− 0.13	− 1.93	+ 1	= + 85	+ 6	− 17 + 58 = + 47	+ 38
2	+ 0.87	− 1.73	+ 1	= + 30	− 38	− 16 + 58 = + 4	+ 26
3	+ 1.87	− 0.51	+ 1	= + 5	− 82	− 5 + 58 = − 29	+ 34
4	+ 1.87	+ 0.51	+ 1	= + 79	− 82	+ 5 + 58 = − 19	+ 98
5	+ 0.87	+ 1.73	+ 1	= + 26	− 38	+ 16 + 58 = + 36	− 10
6	+ 1.56	− 1.14	+ 1	= − 29	− 69	− 10 + 58 = − 21	− 8
7	+ 1.93	− 0.14	+ 1	= − 102	− 85	− 1 + 58 = − 28	− 74
8	+ 1.73	+ 0.86	+ 1	= − 26	− 76	+ 8 + 58 = − 10	− 16
9	+ 1.93	0.00	+ 1	= − 63	− 85	0 + 58 = − 27	− 36
10	0.00	− 1.93	+ 1	= − 10	0	− 17 + 58 = + 41	− 51

+196 − 195

Average (O − C) = 39

P.E = $39 \times \sqrt{\frac{4}{9}} \times 0.84 = \pm 39$

Normal Equations.

a	b	c	
+ 21.40	− 10.31	+ 12.50	= − 214
− 0.31	+ 16.03	− 4.28	= − 89
+ 12.50	− 4.28	+ 10.00	= − 5
+ 0.31	− 0.00	+ 0.18	= − 3
− 12.50	+ 0.48	− 7.30	= + 125
	+ 16.03	− 4.10	= − 92
	− 4.10	+ 2.70	= + 120
	+ 4.10	− 1.05	= − 24
		+ 1.65	= + 96
	− 6.23	+ 4.10	= + 182
	+ 9.80		= + 90
− 15.62	+ 5.35	− 12.50	= + 6
+ 5.35	− 1.83	+ 4.28	= − 2
+ 5.78	+ 5.04		= − 208
+ 5.04	+ 14.20		= − 91
− 1.78	− 5.04		= + 32
+ 4.00			= − 176
+ 11.08a	+ 6.43c		=

$\frac{\Delta S}{\Delta n} = 1.94 \cdot + .26 = + 0.50$

c = + 58 ± 30

b = + 9 ± 11

a = − 44 ± 19

$\frac{\Delta a}{\Delta n} = 1.94 \cdot - 58 = - 1.13$

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1912 Nov. 29

Normal equations

	a	b	c	O	Resid.	C	O − C
1	− 0.18	− 1.93	+ 1	= + 85	+ 6	− 17 + 58 = + 47	+ 38
2	+ 0.87	− 1.73	+ 1	= + 30	− 38	− 16 + 58 = + 4	+ 26
3	+ 1.87	− 0.51	+ 1	= + 5	− 82	− 5 + 58 = − 29	+ 34
4	+ 1.87	+ 0.51	+ 1	= + 79	− 82	+ 5 + 58 = − 19	+ 98
5	+ 0.87	+ 1.73	+ 1	= + 26	− 38	+ 16 + 58 = + 36	− 10
6	+ 1.56	− 1.14	+ 1	= − 29	− 69	− 10 + 58 = − 21	− 8
7	+ 1.93	− 0.14	+ 1	= − 102	− 85	− 1 + 58 = − 28	− 74
8	+ 1.73	+ 0.86	+ 1	= − 26	− 76	+ 8 + 58 = − 10	− 16
9	+ 1.93	0.00	+ 1	= − 63	− 85	0 + 58 = − 27	− 36
10	0.00	− 1.93	+ 1	= − 19	0	− 17 + 58 = + 41	− 51

P.E. = ± 39.

Normal Equations

a	b	c	
+ 21.40	− 0.31	+ 12.50	= − 214
− 0.31	+ 16.03	− 4.28	= − 89
+ 12.50	− 4.28	+ 10.00	= − 5
+ 0.31	− 0.00	+ 0.18	= − 3
− 12.50	+ 0.18	− 7.3	= + 125
	+ 16.03	− 4.10	= − 92
	− 4.10	+ 2.70	= + 120
	+ 4.10	− 1.05	= − 24
		+ 165	= + 96
	− 6.23	+ 4.10	= + 182
	+ 9.80		= + 90
− 15.62	+ 5.35	− 12.50	= + 6
+ 5.35	− 1.82	+ 4.28	= − 2
+ 5.78	+ 5.04		= − 208
+ 5.04	+ 14.20		= − 91
− 1.78	− 5.04		= + 32
+ 4.00			= − 176

$\frac{\Delta S}{\Delta a} = 1.94 + 2.0 + 0.50$

c = + 58 ± 30

b = + 49 ± 11

a = − 44 ± 19

+ 1108 a + 6436 = $\frac{\Delta S}{\Delta a} = 194 - 58 = -1.13$

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MC 933. 1912 Nov. 30.

Moon's mean position (1911.0)

$X_0 =$	-18.8677 ✓	$Y_0 =$	-21.8636 ✓
$+\frac{1}{2}a =$	$-\ 22$ ✓	$+\frac{1}{2}b =$	$+\ 5$ ✓
$X =$	-18.8699 ± 10		-21.8631 ± 5

$R_0^2 = 3.7440$
$+c = +\ 58$
3.7498 ± 30

From preliminary Reduction $X = -18.7537$ ✓ $Y = -21.8918$ ✓
" computed constant $ax = +\ 4$ ✓ $-\ 42$
$by = -\ 17$ ✓ $+\ 7$ ✓
$c = +\ 6$ ✓ $+\ 36$ ✓
$X = -18.7539$ $Y = -21.8917$

$\bar{s} = -0.7539$ $\eta = +0.1083$

$\log \bar{s} = 9.877731\,n$ ✓
" $\cos\delta = 9.983955$ ✓
" const $= 8.507124$
" $\alpha - A = 1.386127\,n$ ✓

$\alpha - A = -\ 24^s.33$
$A = 14\ 32.32$

$\alpha_0 = 14^h\ 32\ 07.67$

From Vol. III p. 67
Red. to app. place in R.A. $= +\ 0^s.08$

$\alpha = 14^h\ 32^m\ 07^s.75$ ✓

$\log \tan\delta = 9.41972\,n$
" $s^2 = 9.75486$
" const $= 7.05134$

$\log \eta_1 = 6.22772\,n$
$\eta_1 = -\ 2$

$\eta_0 = +0.1085$ ✓
$\log \eta_0 = 9.035433$ ✓
" const $= 7.33115$

" $(\delta - D) = 1.70428$ ✓
$\delta - D = +\ 50.6$ ✓
$D = -15\ 29\ 37$ ✓

$\delta_0 = -15^\circ\ 28'\ 46''.4$ ✓

Red. to app. place $= -\ 5.0$

$\delta = -15^\circ\ 28'\ 51''.4$ ✓

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MC 932

1912 Nov. 30.

Transit circle position (1911.0)

X_0 =	18.8677	Y_0 = 21.8636	R_0^2 = 3.7440
$\frac{1}{2}a$	+ 22	$-\frac{1}{2}b^2$ − 5	+ c + 58
X =	18.8699 ± 10	21.8631 ± 5	3.7498 ± 30

Transformation. Reduction to computed constants

X =	18.9861	Y = 21.8344
a_X	+ 4	− 42
b_Y	− 12	+ 7
c	+ 16	+ 36
X =	~~18.9859~~	Y = ~~21.8345~~
	18.7539	21.8917

ξ = −0.9859 η = +0.1655

log ξ	= 9.99383 n	log Tan δ	= 9.41192 n
cos δ	= 9.98397	ξ^2	= 9.99377
"const	= 8.50724	Const	= 7.05134
$\alpha - A$	= 1.50262 n		
		log η_1	= 6.46603 n
$\alpha - A$	= − 31.81	η_1	= − 3
A	= 14 32 32		
		η_0	= + 0.1652
α_0	= ~~14 32 00 14~~	log η_0	= 9.21801
	14 32 07.75	Const	= 7.33115
		(δ − D)	= 1.88686
		δ − D	= + 77.1
		D	= − 15 29 37
		δ_0	= ~~− 15 28 19.9~~
			− 15 28 51.4

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MC 433 1912 Dec. 11.

Lunar Parallax.

α' = 14h 32m 07s.75 ✓
Θ = 14 17 58.95 ✓

$\Theta - \alpha'$ = − 14m 08s.80 ✓
= − 3° 32′ 12″ ✓

$\frac{1}{2}(\alpha - \alpha')$ = − 1′ 18″ ✓

$(\Theta - \alpha') - \frac{1}{2}(\alpha - \alpha')$ = − 3° 30′ 54″ ✓

log tan ϕ' = 9.95727 ✓
" cos $\frac{1}{2}(\alpha - \alpha')$ = 0 0 0 0 0 0
" cos $(\Theta - \alpha') - \frac{1}{2}(\alpha - \alpha')$ = 9.99918 ✓
" Tan γ = 9.95809 ✓

γ = + 42° 14′ 23.″0 ✓
δ' = − 15° 28′ 51.″4
+ 57 43 14.4 ✓

$\gamma - \delta'$ =

log ρ sin ϕ' = 9.82640 ✓
" sin π = 8.20167 ✓
" sin $(\gamma - \delta')$ = 9.92709 ✓
" sin γ = 9.82752 ✓

" sin $(\delta - \delta')$ = 8.12764 ✓
$\delta - \delta'$ = + 46′ 07.″4 ✓

δ = − 14 42 44.0 ✓
Chm Ehk δ = − 14° 42′ 41.″5 ✓

O − C − 2.5
Corr to Tan addn − 0.2
Final (O − C) − 2.7

δ' = − 15° 28′ 50.″5 51.″4 ✓

π = 54′ 41.″8

log ρ cos ϕ' = 9.86913 ✓
" sin π = 8.20167
" " $(\Theta - \alpha')$ = 8.79020 n
" cos δ' = 9.98395 ✓

" sin $(\alpha - \alpha')$ = 6.87714 n

approx $(\alpha - \alpha')$ = − 2′ 35.″4 ✓

log cos δ = 9.98552 ✓
" sin $(\alpha - \alpha')$ = 6.87548

$\alpha - \alpha'$ = − 2′ 34.″9
= − 10.s33

α = 14 31 57.s43 ✓

α = 14h 31m 56.s83 ✓

O − C + 0.60
Corr to Tan addn + 0.03
Final (O − C) + 0.63

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MC 933 1912 Dec. 11.

Lunar Parallax.

$\alpha' = 14^h\ 32^m\ 07^s.75$ $\quad \delta' = -15^\circ\ 28'\ 51''.4$

$\odot = 14\ 17\ 58.95$ $\quad \pi = 54'\ 42''.5$

$\odot - \alpha' = -\ 14^m\ 08^s.80$
$= -\ 3^\circ\ 32'\ 12''$

$\log \rho \cos\phi' = 9.86913$
$\log \sin\pi = 8.20176$
$\log (\odot - \alpha') = 8.79020\,n$
$\log \cos\delta' = 9.98395$

$\frac{1}{2}(\alpha - \alpha') = -\ 1'\ 18''$

$\log \sin(\alpha - \alpha') = 6.87714\,n$

$\alpha' + \frac{1}{2}(\alpha - \alpha') = -\ 3'\ 30'\ 54''$

$\log \tan\phi' = 9.95727$
$\log \cos\frac{1}{2}(\alpha - \alpha') = 0.000000$
$\log \cos(\odot - \alpha') : \frac{1}{2}(\alpha - \alpha') = 9.99418\,n$
$\log \tan\gamma = 9.95809$

$\gamma = +42^\circ\ 14'\ 23''.0$
$\delta' = -15^\circ\ 28'\ 51''.4$
$\gamma - \delta' = +57\ 43\ 14.4$

$\log \rho \sin\phi' = 9.82640$
$\log \sin\pi = 8.20169$
$\log \sin(\gamma - \delta') = 9.92709$
$\log \sin\gamma = 9.82752$

$\log \sin(\delta - \delta') = 8.12770$,
$\delta - \delta' = +\ 46'\ 07''.4$

$\delta = -14\ 42\ 44.0$ $\quad \alpha = 14\ 31\ 57.43$

Finish $\delta = -14^\circ\ 42'\ 41''.5$ $\quad \alpha = 14^h\ 31^m\ 56^s.83$

O - C	− 1.9	+ 0.60
Corr to Ham reading	− 0.2	+ 0.03
Final (O - C)	− 2.7	+ 0.63

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MC933 1913 April. 1 13

Moon — Remeasures. Rescan reversed.

4

	d		n		d		n
1	18606		17490				
2.0	16550	60	9530	28			
2.2	56		26				
	09		90				
	20.2052		.2038				
2	18600		17510				
2.2	16580	90	9517	10			
2.2	69		20				
	00		07				
	20.2024		.2008				
3	17535		16597				
18.0	13465	66	10670	61			
20.4	68		58				
	35		91				
	20.4069		.4067				
4					17450		16060
8.7					14422	11	90769
11.0					18		91
					52		46
					18.6966		.6966
5							
19.0	15883		19190				
21.6	94992	22	15500	80			
	90		95				
	83		82				
	21.6479		.6305				
6							
19.1					1103129		14852
22.0					23		14228	20
					10410		20
					19.0618		.0629

very oblique.

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Moon – Rumeasures.
Rescans reversed.

	4				
	d	N		d	N
4	18606	17490			
17.0	16550 60	95 30 28			
20.2	56	26			
	09	90			
	20.7052	.2038			
3	18600	17510			
17.2	16580 90	95 17 10			
20.2	69	20			
	00	07			
	20.7024	.2008			
2	17535	16597			
18.0	13465 66	10670 61			
20.9	68	58			
	35	91			
	20.4069	.4067			
1				17450	16060
18.7				14422 11	90769 1
21.0				18	91
				52	48
				18.6966	6966
5					
19.0	15883	19190			
21.6	9499 22	15500 80			
	90	95			
	83	82			
	21.6479	.6305			
6				1103129	14852
19.1				23	14228 20
22.0				10410	20
				19.0618	.0629

very oblique.

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MC933. 1913 April 1

Groom - Renascuris -

Rescan reversed

	d		w
	11065	-70	14839
	72		14167 -55-
	10400		60
	19.0669		.0678

very oblique.

	18640		18810
	17240	-52	10480 77
	45		78
	30		10
	18.8607		.8632

	d		w
19.1			
22.1			
max in R			
R			
19.0	18315		17764
22.7	11887	1	14130 -30
	79		15
	15		58
	22.6436		.6363
V			
18.9			
23.0			
I			
18.0	17055		16309
23.9	8419	10	1495 -62
	15		51
	62		11
	23.8646		.8647

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MC933. 1913 April 1 14

Droon - Reseaux -

Reseau reversed

y

d N

y	d	N
19.1	11065	14839
22.1	70	14167
	72	55
	10400	66
	19.0669	.0678

max in 26

x		
14.0	18315	17764
22.7	11887	14130
	71	30
	79	15
	15	58
	22.6436	.6363

very oblique.

x		
18.9	18640	18810
23.0	17240	10480
	52	77
	45	78
	30	10
	18.8607	.8632

D		
18.0	17055	16309
23.9	8419	14957
	10	62
	15	51
	62	11
	23.8646	.8647

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MC933-

1913 April 1. 15

Moon's Center.

	x	$x - X_0$		Δx	$(x-X_0)^2$	$(x-X)^2 + (y-Y_0)^2$	O − C
1	17.0000	−0.1333	v	+1	0.0178	3.7527	+115
2	17.1333	0.0000	v	+1	0.0000	3.7462	+50
3	18.0000	+0.8667	v	+1	0.7514	3.7450	+38
4	18.6966	+1.5633	v	0	2.4439	3.7353	−59
5	19.0000	+1.8667	v	0	3.4846	3.7315	−97
6	19.0624	+1.9291	v	0	3.7214	3.7398	−14
7	19.0674	+1.9341	v	0	3.7408	3.7408	−4
8	19.0000	+1.8667	v	−0	3.4846	3.7393	−19
9	18.8620	+1.7287	v	−0	2.9884	3.7364	−48
10	18.0000	+0.8667	v	−1	0.7510	3.7446	+34
						mean 3.7412	−A

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.2045	−1.9312	−14	3.7349
2	20.2016	−1.9341	−14	3.7462
3	20.4068	−1.7289	−13	2.9936
4	21.0000	−1.1357	−7	1.2914
5	21.6392	−0.4965	−4	0.2469
6	22.0000	−0.1357	−1	0.0184
7	22.1357	0.0000	0	0.0000
8	22.6400	+0.5043	+4	0.2547
9	23.0000	+0.8643	+6	0.7480
10	23.8646	+1.7289	+13	2.9936

Approximate Center.

x = 18.0 y = 20.4068 + 23.8646 = 44.2714

Mean: 22.1357

y = min: 20.2016

R: 1.9341

x = max: 19.0674

X_0 = 17.1333

x = 19.0 y = 21.6392 + 22.6400 = 44.2792

Mean: 22.1396

Center { X_0 = 17.1333 ; Y_0 = 22.1357

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MC 933 - 1913 April 1.

Moon's Center.

	x	$x - X_0$	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	17.0000	−0.1333	+1	0.0178	3.7527	+115
2	17.1333	0.0000	+1	0.0000	3.7462	+50
3	18.0000	+0.8667	+1	0.7514	3.7450	+38
4	18.6966	+1.5633	+0	2.4439	3.7353	−59
5	19.0000	+1.8667	+0	3.4846	3.7315	−97
6	19.0624	+1.9291	+0	3.7214	3.7398	−14
7	19.0674	+1.9341	0	3.7408	3.7408	−4
8	19.0000	+1.8667	−0	3.4846	3.7393	−19
9	18.8620	+1.7287	−0	2.9884	3.7364	−48
10	18.0000	+0.8667	−1	0.7510	3.7446	+34

Mean 3.7412

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.2045	−1.9312	−14	3.7349
2	20.2016	−1.9341	−14	3.7462
3	20.4068	−1.7289	−13	2.9936
4	21.0000	−1.1357	−7	1.2914
5	21.6392	−0.4965	−4	0.2469
6	22.0000	−0.1357	−1	0.0184
7	22.1357	0.0000	0	0.0000
8	22.6400	+0.5043	+4	0.2547
9	23.0000	+0.8643	+6	0.7480
10	23.8646	+1.7289	+13	2.9936

Approximate Center.

$x = 18.0$ $y = 20.4068$
23.8646
44.2714
Mean: 22.1357
y = min: 20.2016
R: 1.9341
x = max: 19.0674
Y_0 = 17.1333

$x = 19.0$ $y = 21.6392$
22.6400
44.2792
Mean: 22.1396

Center $\begin{cases} X_0 = 17.1333 \\ Y_0 = 22.1357 \end{cases}$

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No	ab	ac	bc
1	+ 0.25	− 15.0	−222.0
2	− 0.00	+ 0.0	− 96.5
3	− 1.51	+ 33.0	− 65.6
4	− 1.78	− 92.0	+ 67.3
5	− 0.94	− 181.0	+ 48.5
6	− 0.27	− 27.0	+ 2.0
7	+ 0.00	− 7.7	− 0.0
8	+ 0.94	− 35.5	− 9.5
9	+ 1.49	− 83.0	− 41.3
10	+ 1.51	+ 29.6	+ 58.8
	−0.31	−378.6	−258.3

$(aa) = +21.38$ $(bb) = +16.03$ $cn = -4$

$(ac) = +12.50$ $(bc) = -4.28$

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MC933. 1913 April 1 16

Moon's Cusp – Ramsayer:

Conditional Equations.

	a	b	c	O		c	O − C
1	−0.13	−1.93	+1	+115	+1	9 − 14 + 93 = +88	+27
2	0.00	−1.93	+1	+50		0 − 14 + 93 = +79	−29
3	+0.87	−1.73	+1	+38	−625	12 + 93 = +19	+19
4	+1.56	−1.14	+1	−59	−111	−8 + 93 = −26	−33
5	+1.87	−0.50	+1	−97	−133	−4 + 93 = −44	−53
6	+1.93	−0.14	+1	−14	−137	−1 + 93 = −45	+31
7	+1.93	+0.00	+1	−4	−137	0 + 93 = −44	+40
8	+1.87	+0.50	+1	−19	−133	4 + 93 = −36	+17
9	+1.73	+0.86	+1	−48	−123	6 + 93 = −24	−24
10	+0.87	+1.73	+1	+34	−62	12 + 93 = +43	−9

−148 + 134

Average O − C = 28

P.E. = 28

Normal Equations

a	b	c	
+21.38	− 0.31	+ 12.50	= −379
− 0.31	+ 16.03	− 4.28	= −258
+12.50	− 4.28	+ 10.00	= −4
+ 0.31	− 0.00	+ 0.18	= −6
−12.50	+ 0.18	− 7.32	= +222
	+ 16.03	− 4.10	= −264
	− 4.10	+ 2.68	= +218
	+ 4.10	− 1.05	= −67
		+ 1.63	= +151
	− 6.27	+ 4.10	= +334
	+ 9.76		= +70
− 0.90	+ 0.31	− 0.72	= +0
+4680	− 16.03	+ 3743	= −15
+2048		+ 11.74	= −379
+46.49		+ 33.15	= −273
− 16.50		− 11.78	= +97
+ 3.98			= −282

c = +92.5 ± 22

b = +7 ± 9

a = −71 ± 14

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HC 933. 1913 April 1.

Moon's Centre – Kamasaumo:

Conditional Equations.

	a	b	c	O		c	O − C
1	−0.13	−1.93	+1	+115	+	9 − 14 + 93 = +88′	+27
2	0.00	−1.93	+1	+50		0 − 14 + 93 = +79′	−29
3	+0.87	−1.73	+1	+38	−	62 − 12 + 93 = +19′	+19
4	+1.56	−1.14	+1	−59	−	111 − 8 + 93 = −26	−33
5	+1.87	−0.50	+1	−97	−	133 − 4 + 93 = −44	−53
6	+1.93	−0.14	+1	−14	−	137 − 1 + 93 = −45	+31
7	+1.93	+0.00	+1	−4	−	137 + 0 + 93 = −44	+40
8	+1.87	+0.50	+1	−19	−	133 + 4 + 93 = −36	+10
9	+1.73	+0.86	+1	−48	−	123 + 6 + 93 = −29	−24
10	+0.87	+1.73	+1	+34	−	62 + 12 + 93 = +43	−9

−148 +134

Average O−C: 28

P.E. = ±28

Normal Equations

a	b	c	
+21.38	−0.31	+12.50	= −379
−0.31	+16.03	−4.28	= −258
+12.50	−4.28	+10.00	= −4
+0.31	−0.00	+0.18	= −6
−12.50	+0.18	−7.32	= +222
	+16.03	−4.10	= −264
	−4.10	+2.68	= +218
	+4.10	−1.05	= −67
		+1.63	= +151
	−6.27	+4.10	= +334
	+9.76		= +70

c: +92.5 ± 22

b: +7 ± 9

−0.90	+0.31	−0.72	+0
+46.80	−16.03	+37.43	−15
+20.48		+11.78	= −379
+46.49		+33.15	= −273
−16.50		−11.78	= +97
+3.98			= −282

a: −71 ± 14

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MC933

1913 April 1.

First Measures

X = 17.1301 ± 10
Y = 22.1369 ± 5
R = 1.9364 ± 8
= 903.3

Second Measures

X = 17.1298 ± 7
Y = 22.1361 ± 4
R = 1.9366 ± 6
= 903.13

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MCR 33

1913 April 1.

First Measures

X = 17.1301 ± 10
Y = 22.1369 ± 5
R = 1.9369 ± 8
= 903.3

Second Measures.

X = 17.1298 ± 7
Y = 22.1364 ± 4
R = 1.9366 ± 6
= 903."3

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1912 Oct 31.

MC934

Standard Coordinates.

Star	1	2	3
α	$14^h\ 25^m\ 21^s.53$	$14^h\ 27^m\ 02^s.91$	$14^h\ 35^m\ 13^s.13$
A	14 32 10	14 32 10	14 32 10
δ − A	+ 6 48 47	− 5 07.09	+ 3 3.13
sin(α−A)	− 408.41	− 307.06	+ 183.12
log "	2.61110	2.48722	2.26274
" cos δ	9.99524	9.99821	9.99824
" ξ₀	1.10358	0.97737	0.75322
ξ₀	−12.6935	−9.4922	+5.6652
ξ₁	− 58	− 23	+ 5
ξ	5.8007	8.5055	23.6657
x	5.2930	8.4160	23.5855
x − ξ	− 1077	− 895	− 802

δ	−14° 51′ 14.8″	−15° 58′ 05.9″	−15 49 03.1
D	−15 33 25	−15 33 25	−15 33 25
δ − D	+ 42 10.2	− 24 40.9	− 15 38.1
tan(δ−D)	+ 2530.3	− 1480.9	− 938.1
log "	3.40317	3.17053	2.97225
" cos δ₀	0.73432	0.50168	0.30340
" tan δ	9.42836	9.45666	9.45222
" ξ²	2.2072	1.9547	1.5064
" η₁	8.6842	8.4647	8.0120
η₀	+5.4240	−3.1745	−2.0110
η₁	− 483	− 292	− 103
η	27.3957	18.7963	19.9787
y	27.5266	18.9221	19.9603
y − η	+ 1509	+ 1258	− 184

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Mc934 1912 Oct 31. 20

Standard Coordinates

	1	2	3
α	$14^h\ 25^m\ 21^s.53$	$14^h\ 27^m\ 02.91$	$14^h\ 35^m\ 13^s.13$
λ	14 32 06	14 32 06	14 32 06
	+ 6 4447	− 5 0309	+ 3 0713
	− 4044.1	− 303.07	+ 187.12
	2.606820	2.481555	2.272122
	9.998524	9.998291	9.998324
	1.049930	0.971170	0.760260
	−12.5689	− 9.3692	+ 5.7690
	− 56	− 42	+ 5
	− 5.4255	8.6286	2.378495
	5.2930	8.4160	24.3078
	− 1325	− 2126	+ 5183
δ	−14° 51′ 14.8″	−15° 58′ 05.9″	−15° 49′ 09.1″
D	−15 33 16	−15 33 16	−15 33 16
	+ 42 01.2	− 24 49.9	− 15 47.1
	+ 2521.3	− 1489.9	− 947.1
	3.401682	3.191316m	2.976404m
	0.732777	0.504319m	0.307559m
	9.42236m	9.4566m	9.4522m
	2.1986	1.9434	1.5252
	8.6756m	8.4534m	8.0308m
	+ 5.4046	− 3.1938	− 2.0302
	− 474	− 278	− 107
	27.3572	18.7784	19.4591
	27.5266	18.9221	19.8920
	+ 1694	+ 1437	− 671

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MC 934. 1912 Oct 31. 21

Star	4	5
α	$14^h\ 36^m\ 00.32$ ✓	$14^h\ 36^m\ 36.50$ ✓
A	14 32 10	14 32 10
$\alpha - A$	+ 3 50 32	+ 4 26.50
$\sin(\alpha - A)$	+ 23031	+ 26648
log "	2.362331	2.425667
" $\cos\delta$	9.985077	9.986755
" ξ_0	0.85462	0.91966
ξ_0	+7.1552	+8.3112
ξ_1	+ 13	+ 40
ξ	25.1565	26.3152
x	25.1394	26.3586
$x - \xi$	− 171	+ 434

δ	$-14^\circ\ 56'\ 16.3''$ ✓	$-14^\circ\ 04'\ 55.2''$ ✓
D	−15 33 25 ✓	−15 33 25
$\delta - D$	+ 37 08.7 ✓	+ 1 28 29.8 ✓
$\tan\delta - D$	+ 2228.8 ✓	+ 5311.0 ✓
log "	3.348077	3.725178
" η_0	0.67922 ✓	1.05633 ✓
" $\tan$	9.42622 n ✓	9.39944 n ✓
" ξ^2	17092 ✓	18393 ✓
" η_1	8.18888 n ✓	8.29211 n ✓
η_0	+4.7777 ✓	+11.3850 ✓
η_1	− 154 ✓	− 196 ✓
n	26.7623 ✓	53.3654
y	26.7244	53.3099
$y - n$	− 379 ✓	− 555 ✓

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NGC 934. 1912 Oct 31.

	4	
α	$14^h\ 36^m\ 00.32$	$14^h\ 36^m\ 36.50$
A	14 32 06	14 32 06
α-A	+ 3 54.32	+ 4 30.50
log(α-A)	+ 2.34.31	+ 2.7048
log	2.34979	2.43214
cos δ	9.98507	9.98675
	0.86210	0.92613
	+7.2795	+ 8.4358
	+ 12	+ 41
	25.2808	26.4399
	25.1394	26.3586
α-β	- 1414	- 813

δ	$-14^\circ\ 56'\ 16.3''$	$-14^\circ\ 04'\ 55.2''$
D	15 33 16	15 33 16
δ-D	+ 36 59.7	+ 1 28 20.8
log(δ-D)	+ 221 9.8	+ 5302.0
log		
cos δ	3.34631	3.72444
	0.67746	1.05559
tang	9.42622n	9.39994n
	17242	18523
η	8.20388n	8.30517n
η	+ 4.7584	+ 113655
η'	- 160	- 202
ξ	26.74244	53.34453
ξ	26.72484	53.30992
ξ-η	- 180	- 354

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MC 934 1912 Oct. 24. 22

Comparison stars. measures.

	y d	y n	x d	x n
1	14549	17321	15396	16211
5.3	9276 84	12570 76	8355 30	13268 72
27.5	82	72	35	76
	57	08	14	98
	27.5272	.5259	5.2924	.2955
2				
8.4	13857	13943	15068	14764
18.9	4651 50	13162 61	9250 51	10601 06
	46	60	46	10
	76	49	98	64
	18.9225	.9217	8.4163	.4158
3				
24.3	15003	15578	13665	15228
19.9	6078 97	14496 96	6744 34	12150 50
	77	90	40	46
	02	080	65	30
	19.8985	.8916	24.3075	.3080
4				
	16555	14968	16761	16188
25.1	9312 10	12218 20	8160 66	14800 00
26.7	12	15	60	97
	53	80	66	96
	26.7243	.7246	25.1397	.1390
5				
	14208	13680	15749	13824
26.3	11109 14	6774 70	9348 47	10236 48
93.3	11	70	42	41
	10	73	59	14
	33.3098	.3100	26.3591	.3581
3				
23.6	14406	15418	14239	15602
19.9	4810 10	15019 20	10101 99	9760 65
	12	20	01	72
	16	30	41	24
	19.9605	.9601	23.5860	.5849

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Comparison stars measured.

	a		n		a		N
1.		4				7	
5.3	14549		17321		15396		16211
27.5	9276	84	12570	76	8335	30	13268	72
	82		72		35		76
	57		08		14		98
	27.5278		.5259		5.2924		.2935
2.							
8.4	13857		13943		15068		14764
18.9	4651	50	13162	61	9250	51	10601	06
	46		60		46		10
	76		49		98		64
	18.9225		.9217		8.4163		.4158
3.							
24.3	15003		15578		13665		15228
14.9	6078	97	14496	96	8744	34	12150	50
	77		90		40		46
	02		88		65		30
	19.8985		.8916		24.3075		.3080
4.							
	16555		14968		16761		16182
25.1	9312	10	12218	20	8160	66	14800	00
46.7	12		15		60		97
	53		80		66		96
	26.7243		.7246		25.1397		.1390
5.							
	14208		13680		15749		13824
26.3	11109	14	6774	70	9348	47	10236	40
93.3	11		70		42		41
	10		73		59		14
	33.3098		.3100		26.3591		.3581
3.							
23.6	14406		15418		14239		15602
14.9	4810	10	15019	20	10101	99	9760	65
	12		20		01		72
	16		0		41		24
	19.9605		.9601		23.5860		.5849

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MC 934.

Mean measured coords of comp stars.

Coords of Plate Center.

Star	x	y
1	5.2930	27.5266 ✓
2	8.4160	18.9221 ✓
3	23.5855	19.9603 ✓
4	25.1394	26.7244 ✓
5	26.3586	33.3099 ✓
5	88.79	126.44 ✓
	17.76	25.29
	.24	3.29
	.31	4.65
	.24	16.45
	.72	19.74 21"
	7.44	13.16
		152.9.85 ✓

mean R.A. = $14^h\ 32^m\ 03^s$
$+\quad\quad\quad\ 7$
$14\ 32\ 10$

mean Decl = $-15^\circ\ 07'\ 55''$ ✓
$-\quad\quad 25\ 30$ ✓
$-15\ 33\ 25$

Preliminary Reductions.

Star	x − 5	− 924		+ 2628
1	− 77	− 2533	= − 2610	= + 18
2	− 895	− 1741	= − 2635	= − 7
3	− 802	− 1836	= − 2638	= − 10
4	− 171	− 2458	= − 2629	= − 1
5	− 434	− 3064	= − 2630	= − 2
mean	18.2613	− 2056 ✓		= 18.3185 ✓
	18.2585			= 18.3157 = new

Star	y − η	+ 98 x		+ 54		− 2197	
1	+ 1509	+ 518	= + 2027	+ 138	= + 2165	= − 32	
2	+ 1258	+ 825	= + 2083	+ 95	= + 2178	= − 19	
3	− 184	+ 2811	= + 2127	+ 100	= + 2227	= + 30	
4	− 379	+ 2464	= + 2085	+ 134	= + 2219	= + 22	
5	− 555	+ 2583	= + 2028	+ 166	= + 2194	= − 3 ✓	
mean	22.3527	+ 1789 ✓		+ 112	=	= 22.3231	
	22.3529				new =	22.3233	

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1912 Oct 24.

MC 934.

Mean measured coords of comp stars.
Coords of Plate Centre.

Star	x	y
1	5.2930	27.5266
2	9.4160	18.9221
3	24.3078	19.8920
4	25.1394	26.7244
5	26.3586	33.3099
5 |	89.51	126.37
	17.90	25.27
	− 10	+ 327
	31	465
	− 3.51	+1521
		25' 21"

Mean R.A. = $14^h\ 32^m\ 03^s$
$+\ 3$
$14\ 32\ 06$

Mean Decl = $-15^\circ\ 07'\ 55''$
$-\ 25\ 21$
$-15\ 33\ 16$

Preliminary Reductions.

Star	x − 5	− 924		+ 2628
1	− 77	− 2533	= − 2610	= + 18
2	− 895	− 1741	= − 2635	= − 7
3	− 802	− 1836	= − 2638	= − 10
4	− 171	− 2458	= − 2629	= − 1
5	− 434	− 3064	= − 2630	= − 2
Mean	18.2613	− 2056		= 18.3185

Star	y − η	+ 98 x		+ 54		− 2197
1	+ 1509	+ 518	= + 2027	+ 138	= + 2165	= − 32
2	+ 1258	+ 825	= + 2083	+ 95	= + 2178	= − 19
3	− 184	+ 2811	= + 2627	+ 100	= + 2227	= + 30
4	− 379	+ 2464	= + 2085	+ 134	= + 2219	= + 22
5	− 555	+ 2583	= + 2028	+ 166	= + 2194	= − 3
Mean	22.3527	+ 1789		+ 112		= 22.3231

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Times etc.

Ex. to stars	1911 Feb. 18	14	26	30.3		-14	35	30.8	
" " moon		14	31	03.1	v	-14	31	03.4	v
Clock fast			2	32.4					
H. sid. T.		14	28	30.85	v				
H. long.		4	44	31.05					
G. sid. T		19	13	01.90	v				
Sid. T. M. moon		21	49	19.29	v				
Interval		21	23	42.61	v				
Reduction			3	30.31	v				
G. M. T.		21	20	12.30					
From Am. Eph. pos.		R. a.				Decl.			
moon 21h		14h	31m	38.34s	v	-14°	40'	45.7"	v
motion in 1m	1.9062							11.934	v
" " 20.205		+		38.51	v	-		4.011	v
Tabular place		14	32	16.85		-14°	44'	46.8"	v
moon's Parallax		54'	41.6"	v					
" semidiam.		14'	55.8"						

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Exp. to stars	1911 Feb. 18	14h	26m	30s	-14h	35m	30s
" " moon		14	31	03.1	-14	31	03.4
Clock fast			2	32.4			
H sid. T.		14	28	30 85			
H long.		4	44	31 05			
G. sid. T		19	13	01.90			
Sid. T. M. noon		21	49	19.29			
Interval		21	23	42.61			
Reduction			3	30.31			
G. M. T.		21	20	1230			

	R. A.			Decl.		
From Am Eph for gros. moon 21h	14h	31m	38.34	-14°	40'	45."7
Motion in 1m 1.90 65				11.423		
" " 20.20	+		38.51	-	4'	01.1
Tabular Place	14	32	16.85	-14°	44'	46.8

Moon's Parallax	54'	41"6
" semidiam	14'	55.8

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Points on Wood's print measures.

	4	
Y (1)	a	N
18.0	15615	14928
20.5	1118091	933126
	7600	2138
	19	26
	20.4430	.4402
2/(8)		
19.0	15561	15994
20.6	986361	1169100
	5567	0686
	65	97
	20.5701	.5701
3/(5)		
20	15719	14681
20.5	1057086	979478
	8389	8908
	23	84
	21.5139	.5110
4/(9)		
20.0	14486	13621
23.2	1245259	553031
	6850	3644
	22	28
	23.1968	.1908
5/(11)		
19.0	14741	16562
24.2	1358081	7897.10
	7480	0601
	31	64
	24.1361	.1340
6/(2)		
18.3	14130	14946
20.5	991014	914956
min	1810	6150
4	36	48
	20.4220	.4207

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Points on two wedges. Direct measures.

4

V	a	N
18.0	15615	14928
20.5	1118091	9331786
	7600	2138
	19	26
	20.4430	.4402
2/		
19.0	15561	15994
20.6	986361	11691100
	5567	0686
	65	97
	20.5701	.5701
3/		
20	15719	14681
21.5	10570 86	9794 78
	8389	8908
	23	84
	21.5139	.5110
4/		
20.0	14486	13621
23.2	1245259	5530 31
	6850	3644
	24	28
	23.1968	.1908
5/		
19.0	14741	16562
24.2	1358081	7897 10
	7480	0601
	31	64
	24.1361	.1340
6/		
18.5	14130	14946
20.5	991014	9149 56
minus	18 10	6150
4	36	48
	28.4220	.4207

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MC 934. 1912 Oct 28. 26

Prints on moon's limb.
measures.
2c

	a	N
7/ (4)	16137	14112
19.6	12520924	768198
21.0	0923	9691
	41	21
	19.6380	.6425
8 (6)	15982	14918
20.2	754638	1333019
22.0	4751	2028
	90	26
	20.1557	.1595
9/ (7)	14937	14947
20.2	6855553	1301510
22.4	5960	1418
max.	49	52
2c	20.1910	.1935
10/ (8)	13898	16012
20.1	4703509	1519104
23.0	0108	0901
	01	15
	20.0804	.0811
11/ (10)	15499	15629
19.3	821821	1295851
24.0	0111	5060
	06	41
	19.2709	.2677

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Points on moon's limb.

measures.

	a	N
7/		
19.6	16137	14112
21.0	12520 24	768198
	0923	9691
	41	21
	19.6380	.6425
8/		
20.2	15982	14918
22.0	7546 38	1333019
	4751	2028
	90	76
	20.1557	.1595
9/		
20.2	14937	14947
22.4	6855 53	1301 510
max in	5960	1418
	49	52
	20.1910	.1933
10/		
20.1	13898	16012
23.0	470309	1519104
	0108	0901
	01	15
	20.0804	.0811
11/		
	15499	15629
19.7	821821	1295851
24.0	0111	5060
	06	41
	19.2709	.2677

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Plate Constants.

Conditional Equations.

Star	a	b	c	x − x̄	y − ȳ
1	+5.29	+27.53	+1	= +18	−32
2	+8.42	+18.92	+1	= −7	−19
3	+23.59	+19.96	+1	= −10	+30
4	+25.14	+26.72	+1	= −1	+22
5	+26.36	+33.31	+1	= −2	−3

Mean Equations.

	+6.86	+23.23	+1 = + 5.50	−25.50
	+25.03	+26.67	+1 = − 4.33	+16.33
	+18.92	+29.19	+1 = + 5.00	− 4.33
	+16.00	+19.44	+1 = − 8.50	+ 5.50
	−18.17	− 3.44	= + 9.83	−41.83
	+ 2.92	+ 9.75	= + 13.50	− 9.83
	− 2.92	− .55	= + 1.58	− 6.72
		+ 9.20 b	= + 15.08	−16.55
		b	= + 1.64	− 1.80

$-18.17\,a = +9.83 + 5.64 = +15.47$ $\qquad -41.83 - 6.19 = -48.02$

$a = -0.85$ $\qquad +2.64$

+5.5	−4.3	+5.0	−8.5
+ 5.8	+21.2	+16.1	+13.6
−38.0	−43.8	−47.9	−31.8
−26.7	−26.9	−26.8	−26.7

c from x − x̄

−25.5	+16.3	−4.3	+5.5
−18.1	−66.0	−49.9	−42.2
+41.8	+48.1	+52.6	+54.9
− 1.8	−1.6	− 1.6	−1.8

c from y − ȳ

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Plate Constants.

Conditional equations.

Star	a	b	c	x − x̄
1	+ 5.29	+ 27.53	+ 1	= + 18
2	+ 8.42	+ 18.92	+ 1	= − 7
3	+ 23.59	+ 19.96	+ 1	= − 10
4	+ 25.19	+ 26.72	+ 1	= − 1
5	+ 26.36	+ 33.31	+ 1	= − 2

Mean Equations.

	+ 6.86	+ 23.23	+ 1 = + 5.50	− 25.50
	+ 25.03	+ 26.67	+ 1 = − 4.33	+ 16.33
	+ 18.92	+ 29.19	+ 1 = + 5.00	− 4.33
	+ 16.00	+ 19.44	+ 1 = − 8.50	+ 5.50
	− 18.17	− 3.44	= + 9.83	− 41.83
	+ 2.92	+ 9.75	= + 13.50	− 9.83
	− 2.92	− .55	= + 1.58	− 6.72
		+ 9.20 b	= + 15.08	− 16.55
		b	= + 1.64	− 1.80

$-18.17\,a = +9.83 + 5.64 = +15.47$ $\qquad -41.83 - 6.19 = -48.02$

$a = -0.85$ $\qquad +2.64$

+ 5.5	− 4.3	+ 5.0	− 8.5
+ 5.8	+ 21.2	+ 16.1	+ 13.6
− 38.0	− 43.8	− 47.9	− 31.8
− 26.7	− 26.9	− 26.8	− 26.7

c from x − x̄.

− 25.5	+ 16.3	− 4.3	+ 5.5
− 18.1	− 66.0	− 99.9	− 42.2
+ 41.8	+ 48.1	+ 52.6	+ 34.9
− 1.8	− 1.6	− 1.6	− 1.5

c from y − ȳ

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MC 934 1912 Nov. 20.

Plate comparisons.

Residuals in x.

Star			C	O	O - C
1	- 4	+45 - 27	= +14	+18	+4
2	- 7	+31 - 27	= - 3	- 7	-4
3	-20	+33 - 27	= -14	-10	+4
4	-21	+44 - 27	= - 4	- 1	+3
5	-22	+55 - 27	= + 6	- 2	-8

Resids. in y.

Star			C	O	O - C
1	+14	-50 - 2	= -38	-32	+6
2	+22	-34 - 2	= -14	-19	-5
3	+62	-36 - 2	= +24	+30	+6
4	+66	-48 - 2	= +16	+22	+6
5	+70	-60 - 2	= + 8	- 3	-11

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NGC 4374 1912 Nov. 20.

Plate Comet Faint

Residuals in ξ.

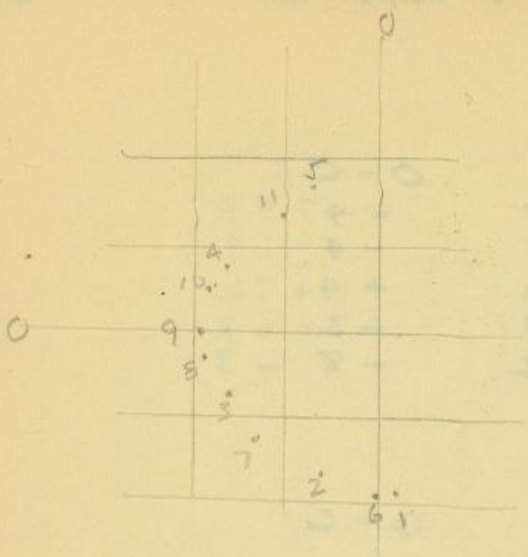
Star			C	O	O − C
1	− 4	+45 − 27 =	+14	+18	+ 4
2	− 7	+31 − 27 =	− 3	− 7	− 4
3	− 20	+33 − 27 =	− 19	− 10	+ 9
4	− 21	+49 − 27 =	+ 4	− 1	+ 3
5	− 22	+55 − 27 =	+ 6	− 2	− 8

Resids. in η.

Star			C	O	O − C
1	+14 − 50 − 2 =		− 38	− 32	+ 6
2	+22 − 34 − 2 =		− 14	− 19	− 5
3	+62 − 36 − 2 =		+ 24	+ 30	+ 6
4	+66 − 48 − 2 =		+ 16	+ 22	+ 6
5	+70 − 60 − 2 =		+ 8	− 3	− 11

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Point	Pos. ∠	Residual
1	187°.8	−43
6	180.0	+51
2	157.5	−23
7	134.2	+36
3	115.8	−1
8	100.5	−21
9	90.0	−20
10	70.4	0
4	64.2	+12
11	31.2	+32
5	22.5	−24

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MC934. 1912 Nov. 23.

Moon's center.

Point	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	18.0000	−0.2610	0.0681	3.7254	−55
2	19.0000	+0.7390	0.5461	3.7280	−29
3	20.0000	+1.7390	3.0241	3.7310	+1
4	20.0000	+1.7390	3.0241	3.7327	+18
5	19.0000	+0.7390	0.5461	3.7287	−22
6	18.2610	0.0000	0.0000	3.7350	+41
7	19.6402	+1.3792	1.9022	3.7344	+35
8	20.1576	+1.8986	3.6047	3.7292	−17
9	20.1922	+1.9312	3.7295	3.7295	−14
10	20.0808	+1.8198	3.3117	3.7315	+6
11	19.2693	+1.0083	1.0167	3.7346	+35
				3.7309	−1

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.4416	−1.9110	−14	3.6573
2	20.5701	−1.7825	−13	3.1819
3	21.5124	−0.8402	−6	0.7069
4	23.1938	+0.8412	+6	0.7086
5	24.1350	+1.7824	+13	3.1816
6	20.4214	−1.9312	−14	3.7350
7	21.0000	−1.3526	−10	1.8322
8	22.0000	−0.3526	−3	0.1245
9	22.3526	0.0000	0	0.0000
10	23.0000	+0.6474	+5	0.4198
11	24.0000	+1.6474	+12	2.7179

App. center

x = 19.0 y = 20.5701
24.1350
44.7051
mean y = 22.3526
y = min = 20.4214
R = 1.9312
x = max = 20.1922
X_0 = 18.2610

x = 20.0 y = 21.5124
23.1938
44.7062
mean y = 22.3531

Assume $X_0 = 18.2610$, $Y_0 = 22.3526$

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Point	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	18.0000	−0.2610	0.0681	3.7254	−55
2	19.0000	−0.7390	0.5461	3.7280	−29
3	20.0000	+1.7390	3.0241	3.7310	+1
4	20.0000	+1.7390	3.0241	3.7327	+18
5	19.0000	−0.7390	0.5461	3.7287	−22
6	18.2610	0.0000	0.0000	3.7350	+41
7	19.6402	+1.3792	1.9022	3.7344	+35
8	20.1576	+1.8986	3.6047	3.7292	−17
9	20.1922	+1.9312	3.7295	3.7295	−14
10	20.0808	+1.8198	3.3117	3.7315	+6
11	19.2693	+1.0083	1.0167	0.7346	+35
				3.7309	−1

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.4416	−1.9110	−14	3.6573
2	20.5701	−1.7825	−13	3.1819
3	21.5124	−0.8402	−6	0.7069
4	23.1938	+0.8412	+6	0.7086
5	24.1350	+1.7824	+13	3.1816
6	20.4214	−1.9312	−14	3.7350
7	21.0000	−1.3526	−10	1.8322
8	22.0000	−0.3526	−3	0.1245
9	22.3526	0.0000	0	0.0000
10	23.0000	+0.6474	+5	0.4198
11	24.0000	+1.6474	+12	2.7179

App. Center

x = 19.0 y = 20.5701
24.1350
44.7051
mean y = 22.3526
y − mean = 20.4214
R = 1.9312
X = max = 20.1922
X_0 = 18.2610

x = 20.0 y = 21.5124
23.1938
44.7062
mean y = 22.3531

Assume X_0 = 18.2610, Y_0 = 22.3526

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Formation of normals.

No	ab		ac		bn	
1	+	0.50	+	14.3	+	105.0
2	-	1.32	-	21.5	+	51.6
3	-	1.46	+	1.7	-	0.8
4	+	1.46	+	31.3	+	15.1
5	+	1.32	-	16.3	-	3.92
6	-	0.00	+	0.6	-	79.1
7	-	1.86	+	48.3	-	47.3
8	-	0.66	-	32.3	+	6.0
9		0.20	-	27.0		0.0
10	+	1.18	+	10.9	+	3.9
11	+	1.67	+	35.4	+	57.8
	+	0.83	+	49.8	+	73.0

[aa] = +20.77 [bb] = +20.76

[ac] = +12.74 [bc] = − 3.84 [cn] = − 1

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MC934 1912 Nov. 30 30

Moon's outer

Conditional Equations

	a	b	c	O	Resids	C	O-C
1	-0.26	-1.91	+1	= -55	-2 -4 -6	= -12	-43
2	+0.74	-1.78	+1	= -29	+4 -4 -6	= -6	-23
3	+1.74	-0.84	+1	= +1	+10 -2 -6	= +2	-1
4	+1.74	+0.84	+1	= +18	+10 +2 -6	= +6	+12
5	+0.74	+1.78	+1	= -22	+4 +4 -6	= +2	-24
6	0.00	-1.93	+1	= +41	+0 -4 -6	= -10	+51
7	+1.38	-1.35	+1	= +35	+8 -3 -6	= -1	+36
8	+1.90	-0.35	+1	= -17	+11 -1 -6	= +4	-21
9	+1.93	0.00	+1	= -14	+12 +0 -6	= +6	-20
10	+1.82	+0.65	+1	= +6	+11 +1 -6	= +6	0
11	+1.01	+1.65	+1	= +35	+6 +3 -6	= +3	+32

+131 -132

Normal Equations.

Average (O-C) = 24

P.E. = $24 \times \sqrt{\frac{1}{8}} \times 0.84 = \pm 24$

a

$+20.77 + 0.83 + 12.74 = +45$
$+0.83 + 20.26 - 3.24 = +73$
$+12.74 - 3.24 + 11.00 = -1$

$-0.83 - 0.03 - 0.51 = -2$
$-12.74 - 0.51 - 7.83 = -28$

$+20.23 - 3.75 = +71$
$-3.75 + 3.17 = -29$

$+3.75 - 0.69 = +13$
$+2.48 = -16$

$-3.80 + 3.75 = -29$
$+16.43 = +42$

$\frac{\Delta\delta}{\Delta\alpha} = 193 \cdot +.19 = +0.36$

$c = -6$

$b = +2$

$-14.74 + 3.75 - 12.74 = +1$
$+3.75 - 0.95 + 3.24 = -0$

$+6.03 + 4.58 = +46$
$+4.58 + 19.31 = +73$

$-1.09 - 4.58 = -17$

$+4.94 = +29$

$a = +6$

$-5.06a \quad -3.08$

$\frac{\Delta\delta}{\Delta\alpha} = 1.93 \cdot -.61 = -1.18$

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MC 934 1912 Nov 30 30

Moons anlu

Conditional Equations

	a	b	c	O	Residuals			C	O-C
1	−0.26	−1.91	+1	= −55	−2	−4	−6	= −12	−43
2	+0.79	−1.78	+1	= −29	+4	−4	−6	= −6	−23
3	+1.74	−0.84	+1	= +1	+10	−2	−6	= +2	−1
4	+1.74	+0.84	+1	= +18	+10	+2	−6	= +6	+12
5	+0.74	+1.78	+1	= −22	+4	+4	−6	= +2	−24
6	0.00	−1.93	+1	= +41	0	−4	−6	= −10	+51
7	+1.38	−1.35	+1	= +35	+8	−3	−6	= −1	+36
8	+1.90	−0.35	+1	= −17	+11	−1	−6	= +4	−21
9	+1.93	0.00	+1	= −14	+12	0	−6	= +6	−20
10	+1.82	+0.65	+1	= +6	+11	+1	−6	= +6	0
11	+1.01	+1.65	+1	= +35	+6	+3	−6	= +3	+32

Normal Equations

a

+20.77 + 0.83 + 12.74 = +45
+ 0.83 + 20.26 − 3.24 = +73
+12.74 − 3.24 + 11.00 = − 1

− 0.83 − 0.03 − 0.51 = − 2
−12.74 − 0.51 − 7.83 = −28

+20.23 − 3.75 = +71
− 3.75 + 3.17 = −29

+ 3.75 − 0.69 = +13
+ 2.48 = − 16

c = − 6

− 3.80 + 3.75 = −29
+16.43 = +42

b = + 2

−14.74 + 3.75 − 12.74 = + 1
+ 3.75 − 0.95 + 3.24 = − 0

+ 6.03 + 4.58 = +46
+ 4.58 + 19.31 = +73

− 1.09 − 4.58 = −17

+ 4.94 = +29

a = + 6

−5.06a −3.08

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$X_0 = 18.2610$	$Y_0 = 22.3526$	$R_0^2 = 3.7309$
$\pm \frac{1}{2}a = +3$	$+\frac{1}{2}b = +1$	$+c = -6$
$X = 18.2613$	$Y = 22.3527$	$R^2 = 3.7303$

From photom. Reduction $X = 18.3185$ $Y = 22.3231$

" computed constants $ax = -16$ $+48$

$by = +36$ -40

$c = -27$ -2

$X = 18.3178$ 22.3237

$\xi = +0.3178$

$\log \xi = 9.502115$

" $\cos\delta = 9.998386$

" $\operatorname{arc}(1) = 8.507724$

$\log(\alpha - A) = 1.01105$

$\alpha - A = 10^s.26$

$A = 14\ 32\ 10$

$\alpha = 14^h\ 32^m\ 20^s.26$

Vol. III p. 67 Red. to apth place +.08

$\alpha = 14^h\ 32^m\ 20^s.34$

Rem α_0 = 14 32 20 20

Mean 14 32 20.73

$\eta = +0.3237$

$\log \operatorname{Tan}\delta = 9.42044$n

" $\xi^2 = 9.0043$

" const = 7.0534

" $\eta_1 = 5.47810$

η_1 0

$\log \eta_0 = 9.51014$

" const = 7.83115

$\log(\delta - D) = 2.17899$

$\delta - D = 151.0$

$D = -15\ 33\ 25$

$\delta = -15°30'54.0$

Red. to apth place = −5.0

$\delta = -15°30'59.0$

Rem δ_0 = −15 30 54.0

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$X_0 = 18.2610$	$Y_0 = 22.3526$	$R_0^2 = 3.7309$
$\pm \frac{1}{2}a =$ + 3	$+\frac{1}{2}b =$ + 1	$+c =$ − 6
$X = 18.2613$	$Y = 22.3527$	$R^2 = 3.7303$

From formulæ. Reduction to computed constants

$Y = 18.31854$	$= 22.3231$	
$ax =$ − 16	+ 48	
$by =$ + 36	− 40	
$c =$ − 27	− 2	
$X = 18.3178$	22.3237	

$\xi = +0.3178$

$\log \xi = 9.50215$

$\therefore \log \cos\delta = 9.98386$

$\operatorname{arc}\sin\delta = 8.50724$

$\therefore (X - A) = 1.01105$

$X - A = 1^m 10^s.26$

$A = 14\ 32\ 10$

$\alpha = 14^h\ 32^m\ 20^s.26$

Red. to app. of date +.07 Red. to app. of place +.08

$\alpha = 14^h\ 32^m\ 20^s.34$

$\eta = +0.3237$

$\log \tan\delta = 9.42044_n$

$\therefore \log \xi^2 = 9.0043$

$\operatorname{arc}\sin = 7.0534$

$\therefore \eta_1 = 5.4781_n$

$\eta_0 = 0$

$\log \eta_0 = 9.51014$

$\therefore \operatorname{arc}\sin = 7.83115$

$\log(\delta - D) = 2.17899$

$\delta - D = 151.0$

$D = -15\ 33\ 25$

$\delta = -15\ 30'\ 54.0''$

Red. to app. of place: − 5.0

$\delta = -15^\circ 30'\ 59.0''$

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MC 934. 1912 Dec 3, 32

Moon —

Lunar parallax.

$\alpha' = 14^h\ 32^m\ 20^s.34$ ✓
$\odot = 14\ 28\ 30.85$
$\odot - \alpha' = -\ 3,49.49$
$= -\ 57'\ 22''.4$

$\frac{1}{2}(\alpha - \alpha') = 21''.$

$(\odot - \alpha') - \frac{1}{2}(\alpha - \alpha') = -\ 57'\ 01''.4$

$\delta' = -\ 15^\circ\ 30'\ 59''.0$ ✓
$IT = 54'\ 41''.6$ ✓

log ρ cos φ′ = 9.86913 ✓
" sin π = 8.20164 ✓
" sin(⊙ − α′) = 8.22246n ✓
" cos δ′ = 9.98386 ✓

" sin(α − α′) = 6.30944n ✓

$\alpha - \alpha' = -0'\ 42''.0$ ✓

log tan φ′ = 9.95727
" cos ½(α − α′) = 0.00000
" cos[(⊙ − α′) − ½(α − α′)] = 9.99994 ✓
" tan γ = 9.95733 ✓
$\gamma = +42^\circ\ 11'\ 24''.0$ ✓
$\delta' = -15\ 31\ 32.9$

$\gamma - \delta' = +57\ 42\ 56.9$ ✓

log cos δ = 9.98546 ✓
" sin(α − γ′) = 6.30773 ✓

$\alpha - \alpha' = -0'\ 41''.9$ ✓
$= -0^m\ 2^s.79$ ✓

log ρ sin φ′ = 9.82640 ✓
" sin π = 8.20164 ✓
" sin(γ − δ′) = 9.92707 ✓
" sin γ = 9.82711 ✓

" sin(δ − δ′) = 8.12800 ✓

$\delta - \delta' = +\ 46'\ 09''.8$

$\delta = -14\ 44\ 49.2$ ✓ $\alpha = 14\ 32\ 17.55$ ✓

Am Ehk $\delta = -14^\circ\ 44'\ 46''.8$ $\alpha = 14^h\ 32^m\ 16^s.85$ ✓

$O - C$: $-\ 2''.4$ $+\ 0^s.70$ ✓

Rem δ — $14\ 32\ 17.49$

mean $14\ 32\ 17.52$

$O - C$ $+\ 0.67$

Corr to stan. radius $+\ 02$ $-\ 0.05$

Mean $(O - C)$ $-\ 2.2$ $+\ 0.62$

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MC 934. 1912 Dec 3, 32

Moon –

Lunar parallax.

α' = 14h 32m 20.34
$\odot$ = 14 28 30.85
$\odot - \alpha'$ = – 3, 49.49
= – 57' 22.4

$\frac{1}{2}(\alpha - \alpha')$ – 21.

$(\odot - \alpha') - \frac{1}{2}(\alpha - \alpha')$ = – 57' 01.4

δ' = – 15° 31' 59.0
IT = 54' 41.6

log cos ϕ' = 9.869135
∴ sin IT = 8.201647
∴ sin $(\odot - \alpha')$ = 8.222426n
∴ cos δ' = 9.983866
∴ sin $(\alpha - \alpha')$ = 6.309444n

$\alpha - \alpha'$ = – 0' 42.0"

log tan ϕ' = 9.957727
∴ cos $\frac{1}{2}(\alpha - \alpha')$ = 0.000000
∴ cos $(\odot - \alpha') - \frac{1}{2}(\alpha - \alpha')$ = 9.999994
∴ tan γ = 9.957733
γ = + 42° 11' 24.0
δ' = – 15 31 32.9

log cos δ' = 9.985444
∴ sin $(\alpha - \alpha')$ = 6.307866n

$\alpha - \alpha'$ = – 0' 41.9
= – 0m 2.79

$\gamma - \delta'$ = + 57 42 56.9

log ρ sin ϕ' = 9.826400
∴ sin IT = 8.201647
∴ sin $(\gamma - \delta')$ = 9.927077
∴ sin γ = 9.827111

∴ sin $(\delta - \delta')$ = 8.128000

$\delta - \delta'$ = + 46' 09.8

δ = – 14 44 49.2 α = 14 32 17.55

Am Ephk δ = – 14° 44' 46.8 α = 14h 32m 16.85

O – C = – 2.4 = + 0.70

Remarks

α = 14 32 17.49

mean α = 14 32 17.52
O – C = + 0.67
– 0.05
+ 0.62

Am to star radius + 0.2

final (O – C) = – 2.2

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HC 934 1913 April

Moon - Renascamus.

d	N
18.0 15950	17958
20.4 11 5 52 55	12 35 0 51
59	61
65	68
20.4402	.4390

14930	17984
10745 51	12171 78
55	68
40	90
20.4184	.4184

14886.	17049
9215 29	17730 25
15	30
98	53
20.5673	.5671

19048	18497
15468 70	12089 89
67	89
60	98
19.64 16	.6409

17204	16420
12029 40	11552 50
39	50
20	28
21.5178	.5127

oblique

17825	16610
9405 00	14995 86
10	90
25	08
20.1580	.1620

17761	16621
9699 00	14687 86
00	90
67	31
20.1934	.1935

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HC 934. 1913 April 1.

Moon - Remeasures.

	d	N	d	N
1/			4	∞
18.0	15950	17958		
20.4	11552 5	12350 51		
	59	61		
	65	68		
	20.9402	.4390		
2/				
18.3	14930	17984		
20.4	10745 51	12171 78		
	55	68		
	40	90		
	20.4184	.4184		
3/	14856	17049		
19.0	9215 29	12730 25		
20.6	15	30		
	18	53		
	20.5673	.5671		
4/				
19.6			19048	18497
21.0			15468 70	12089 89
			67	81
			60	98
			19.6416	.6409
5/				
20.6	17204	16420		
21.5	12029 40	11552 50		
	34	50		
	20	28		
	21.5178	.5127		
6/				
20.2			17825	16610
22.0			9405 00	14995 86
			10	90
			25	08
			20.1580	.1620
7/				
19.2			17761	16621
22.4			9699 00	14687 86
			00	90
			67	31
			20.1934	.1935

oblique

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NIC 934. 1913 April 1.

Moon — Remeasures.

	d			d	
8.				16707	15678
No. 1				75092 1	14.87060
23.0				00	64
				19	88
				20.0792	.0814

9					
20.0	14718		18566		
23.2	12265	74	10497	00	
	53		87		
	23		76		
	23.19553		.19721		

obliques

10					
19.3					
24.0					
	15981		18949		
	8682	71	16218	40	
	75		19		
	88		59		
	19.2690		.2726		

11					
19.0	18929		17734		
24.2	17541	43	9125	31	
	48		21		
	35		49		
	24.13866		.13779		

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NIC 934. 1913 April 1. 34

Moon — Remeasures.

	a		n		d		x		N
8/					16707		15678		
20.1					7505	21	1487060		
23.0					08		64		
					19		88		
					20.0792		.0814		
9									
20.0	14218		18566						
23.2	12265	74	1049700						
	53		87						
	23		76						
	23.1955		.1921						
									obliquo
10									
16.3					15981		18949		
24.0					8682	71	1621840		
					75		19		
					68		59		
					19.2690		.2726		
11									
19.0	18929		17734						
24.2	17541	43	912531						
	48		21						
	35		49						
	24.1386		.1379						

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Moon's Center - Remeasures.

	x	$x - X_0$	Δx	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	18.0000	−0.2591	+0	0.0671	3.7324	−71
2	18.2591	0.0000	+	0.0000	3.7469	+74
3	19.0000	+0.7409	+	0.5490	3.7417	+22
4	19.6412	+1.3821	+	1.9102	3.7427	+32
5	20.0000	+1.7409	+	3.0308	3.7332	−63
6	20.1600	+1.9009	+	3.6134	3.7380	−15
7	20.1934	+1.9343		3.7415	3.7415	+20
8	20.0803	+1.8212	−	3.3167	3.7363	−32
9	20.0000	+1.7409	−	3.0308	3.7393	−2
10	19.2708	+1.0117	−	1.0235	3.7411	+16
11	19.0000	+0.7409	−	0.5490	3.7417	+22
				mean	3.7395	+3

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.4396	−1.9131	−14	3.6653
2	20.4184	−1.9343	−14	3.7469
3	20.5672	−1.7855	−13	3.1927
4	21.0000	−1.3527	−10	1.8325
5	21.5152	−0.8375	−6	0.7024
6	22.0000	−0.3527	−3	0.1246
7	22.3527	0.0000	0	0.0000
8	23.0000	+0.6473	+5	0.4196
9	23.1938	+0.8411	+6	0.7085
10	24.0000	+1.6473	+12	2.7176
11	24.1382	+1.7855	+13	3.1927

Approximate Center

x = 19.0 y = 20.5672
24.1382
44.7054
mean y = 22.3527

x = 20.0 y = 21.5152
23.1938
44.7090
mean y = 22.3545

y = min 20.4184
1.9343
x = max = 20.1934
min x = 18.2591

Center $\begin{cases} X_0 = 18.2591 \\ Y_0 = 22.3527 \end{cases}$

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MC934 1913. April 1.

Moon's Center - Remeasured.

	x	$x - X_0$	Δx	$(x-X_0)^2$	$(x-X)^2+(y-Y_0)^2$	O − C
1	18.0000	−0.2591	+0	0.0671	3.7324	−71
2	18.2591	0.0000	+	0.0000	3.7469	+74
3	19.0000	+0.7409	+	0.5490	3.7417	+22
4	19.6412	+1.3821	+	1.9102	3.7427	+32
5	20.0000	+1.7409	+	3.0308	3.7332	−63
6	20.1600	+1.9009	+	3.6134	3.7380	−15
+ 7	20.1934	+1.9343		3.7415	3.7415	+20
8	20.0803	+1.8212	−	3.3167	3.7363	−32
9	20.0000	+1.7409	−	3.0308	3.7393	− 2
10	19.2708	+1.0117	−	1.0235	3.7411	+16
11	19.0000	+0.7409	−	0.5490	3.7417	+22
					mean 3.7395	+ 3

	y	$y - Y_0$	Δy	$(y-Y_0)^2$
1	20.4396	−1.9131	−14	3.6653
2	20.4184	−1.9343	−14	3.7469
3	20.5672	−1.7855	−13	3.1927
4	21.0000	−1.3527	−10	1.8325
5	21.5152	−0.8375	− 6	0.7024
6	22.0000	−0.3527	− 3	0.1246
7	22.3527	0.0000	0	0.0000
8	23.0000	+0.6473	+ 5	0.4196
9	23.1938	+0.8411	+ 6	0.7085
11	24.0000	+1.6473	+12	2.7176
16	24.1382	+1.7855	+13	3.1927

Approximate Center.

x = 19.0 y = 20.5672
24.1382
44.7054
mean y 22.3527
y = min 20.4184
1.9343
x = max = 20.1934
mean x = 18.2591

x = 20.0 y = 21.5152
23.1938
44.7090
mean y = 22.3545

Center { X_0 = 18.2591
Y_0 = 22.3527

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Formation of Normals

No	ab	ac	bn
1	+ 0.50	+ 18.4	+135.7
2	- 0.00	+ 0.0	-143.0
3	- 1.32	+ 16.3	- 39.4
4	- 1.86	+ 44.2	- 43.2
5	- 1.46	- 109.5	+ 52.9
6	- 0.66	- 28.5	+ 5.3
7	+ 0.00	+ 38.6	+ 0.0
8	+ 1.18	- 58.2	- 20.8
9	+ 1.46	- 3.5	- 1.7
10	+ 1.67	+ 16.2	+ 26.4
11	+ 1.32	+ 16.3	+ 39.4
	+ 0.83	- 49.7	+ 11.6

[aa] = +20.83 [bb] = +20.30

[ac] = +12.74 [bc] = -3.24 [cn] = +3

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MC934 1913 April 1. 36

Moon's Centre Reneasures

Conditional Equations

	a	b	c	O			O-C
1	−0.26	−1.91	+1	= −71	+3	−6 +15 = +12	−83
2	+0.00	−1.93	+1	= +74	0	−6 +15 = +9	+65
3	+0.74	−1.79	+1	= +22	−8	−6 +15 = +1	+21
4	+1.38	−1.35	+1	= +32	−15	−5 +15 = −5	+37
5	+1.74	−0.84	+1	= −63	−20	−3 +15 = −8	−55
6	+1.90	−0.35	+1	= −15	−21	−1 +15 = −7	−8
7	+1.93	+0.00	+1	= +20	−22	+0 +15 = −7	+27
8	+1.82	+0.65	+1	= −37	−20	+2 +15 = −3	−29
9	+1.74	+0.84	+1	= −2	−20	+3 +15 = −2	0
10	+1.01	+1.65	+1	= +16	−11	+6 +15 = +10	+6
11	+0.74	+1.79	+1	= +22	−8	+6 +15 = +13	+9
							−175 +165

Average (O-C) = 31

P. E. = ±39

Normal Equations

$$+20.83 + 0.83 + 12.74 = -50$$
$$+0.83 + 20.30 - 3.24 = +12$$
$$+12.74 - 3.24 + 1100 = +3$$

$$-0.83 - 0.03 - 0.51 = +2$$
$$-12.74 - 0.51 - 7.78 = +31$$

$$+20.27 - 3.75 = +14$$
$$-3.75 + 3.22 = +34$$

$$+3.75 - 0.69 = +3$$
$$+2.53 = +37$$

c = +15 ± 19

$$-4.36 + 3.75 = +40$$
$$+15.91 = +54$$

b = +3 ± 8

$$+3.26 - 0.83 + 2.82 = +1$$
$$+79.85 - 20.30 + 68.95 = +19$$

$$+24.09 + 15.56 = -49$$
$$+80.68 + 65.71 = +31$$

$$-19.10 + 15.56 = -7$$
$$+4.99 = -56$$

a = −11 ± 14

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Moon's Centre Measures.

Conditional Equations.

	a	b	c	O						
1	−0.26	−1.91	+1	= −71	+3	−6	+15	= +12	−83
2	+0.00	−1.93	+1	= +74	0	−6	+15	= +9	+65
3	+0.74	−1.79	+1	= +22	−8	−6	+15	= +1	+71
4	+1.38	−1.35	+1	= +32	−15	−5	+15	= −5	+37
5	+1.74	−0.84	+1	= −63	−20	−3	+15	= −8	−55
6	+1.96	−0.35	+1	= −15	−21	−1	+15	= −7	−8
7	+1.93	+0.00	+1	= +20	−22	0	+15	= −7	+27
8	+1.82	+0.65	+1	= −32	−20	+2	+15	= −3	−29
9	+1.74	+0.84	+1	= −2	−20	+3	+15	= −2	+9
10	+1.01	+1.65	+1	= +16	−11	+6	+15	= +10	+6
11	+0.74	+1.79	+1	= +22	−8	+6	+15	= +13	+9
									−175	+165

Average (O−C) = 31

P. E. = ±39

Normal Equations.

+20.83 + 0.83 + 12.74 = −50
+ 0.83 + 20.30 − 3.24 = +12
+12.74 − 3.24 + 11.00 = +3

− 0.83 − 0.03 − 0.51 = + 2
−12.74 − 0.51 − 7.78 = +31

+20.27 − 3.75 = +14
− 3.75 + 3.22 = +34

+ 3.75 − 0.69 = + 3
+ 2.53 = +37

c = +15 ± 19

− 4.36 + 3.75 = +40
+ 15.91 = +54

b = +3 ± 8

− 3.26 − 0.83 + 2.82 + 1
+79.85 − 20.30 + 68.95 + 19

+24.09 + 15.56 = −49
+80.68 + 65.71 = +31

−1910 + 15.56 = − 7
+ 499 = −56

a = −11 ± 14

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First Measures

X = 18.2613 ±
Y = 22.3527 ±
R = 1.9314 ±
= 901.0

Second Measures.

X = 18.2585 ± 7
Y = 22.3529 ± 4
R = 1.9342 ± 5
= 902.3

From Prelim Reduction X = 18.3157 Y = 22.3233
+ 3 + 6
18.3160 22.3239

" Plate constants

ξ = +0.3160
log = 9.499969
cos δ = 9.998386
const = 8.507729

(α - A) = 1.00859

(α - A) = + 10.20
A = 14 32 10
α₀ = 14 32 20.20
Red. = + .08
α' = 14 32 20.28
Red for par. − 0 02.79

α = 14 32 17.49

Am. Eph. α = 14 32 16.85

O - C = 0.64

η = +0.3239

log η₀ = 9.510419
const = 7.331115

log (δ - D) = 2.179269

δ - D = + 2 31.0

D = − 15 33 25
δ₀ = − 15 30 54.0
δ' = − 15 30 59.0

δ = − 14 44 49.2

Am. Eph. δ = − 14 44 46.8

O - C = − 2.4

Giving 1st measures ½ wt.

X₀ = 14 32 20.22
+ 0.08
− 02.7.9

α = 14 32 17.51

Am. Eph. 14 32 16.85

O - C = 0.66

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First measures
X = 18.2613 ±
Y = 22.3527 ±
R = 1.9314 ±
= 901.0

Second measures.
X = 18.2585 ± 7
Y = 22.3529 ± 4
R = 1.9342 ± 5
= 902.3

~~Routine~~ Preliminary Reduction. Plate constants

X = 18.3157 + 3 = 18.3160
Y = 22.3233 + 6 = 22.3239

$\bar{x}$ = +0.3160
log = 9.49969
cos δ = 9.98386
const = 8.50724

$\bar{y}$ = +0.3239

~~y'~~ = 0

log η_0 = 9.51041
const = 7.33115

(α − A) = 1.00859

log (δ − D) = 2.17926

(α − A) = + 10.20
A = 14 32 10
α_0 = 14 32 20.20
Red = + .08
α' = 14 32 20.28
Cor for par. − 0 02.79
α = 14 32 17.49
Comp. Eph. α = 14 32 16.85
O − C = 0.64

δ − D = + 2 31.0
D = − 15 33 25
δ_0 = − 15 30 54.0
δ' = − 15 30 59.0
δ = − 14 44 49.2
Comp. Eph. δ = − 14 44 46.8
O − C = − 2.4

Giving 1st measures ½ wt.

α_0 = 14 32 20.22
+ 0.08
− 02.79
α = 14 32 17.51
Comp. Eph. 14 32 16.85
O − C = 0.66

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MC 966. 1912 Nov. 4, 1912 Nov. 26

Standard Coordinates Comparison Stars.
Astro. Gesell. - Cambridge Eq. 1875.

Star	1 no.	mag	2 no.	mag	3. no.	mag.
C.G.	3805	8.7	3821	8.2	3891	8.0
	x = 25.9	y = 28.8	x = 24.5	y = 13.7	x = 14.5	y = 27.9
α =	7h 04m 38.s13		7h 05m 18.s17		7h 11m 13.s70	
Prec to 1911	+ 2 13.13		+ 2 15.09		+ 2 13.06	
1911	7h 06m 51.s26		7h 07m 33.s26		7h 13m 26.s76	
A	7 11 35		7 11 35		7 11 35	
α-A =	- 4 43.74		- 4 01.74		+ 1 51.76	
sin(α-A)	- 283.72		- 241.73		+ 111.76	
log	2.452894n		2.383833n		2.048284	
- log δ	9.95376		9.94620		9.95328	
log ξ0	0.913894n		0.836774n		0.508804	
ξ0	-8.2014		-6.8670		+3.2270	
ξ1	- 24		- 19		+ 4	
ξ x	25.8998	x	24.4737	x	14.4644	
ξ 5	262038	5	24.8689	5	14.7726	
x-ξ	+ 3040		+ 3952		+ 3082	

signs of x + y changed

δ =	+26° 01' 42.2"	+27° 59' 22.9"	+26° 09' 59.5"
Prec:	- 3 24.2	- 3 26.3	- 3 44.1
1911	+25° 58' 18.0"	+27 55 56.6	+26 06 15.4
D	+26 51 53.	+26 51 53	+26 51 53
δ-D:	- 53 35.0	+1 04 03.6	- 45 37.6
tan(δ-D)	- 3215.3	+ 3847.0	- 2737.8
log	3.507224n	3.584784	3.437404n
log η0	0.838374n	0.915934	0.768554n
tan δ	9.6876	9.7244	9.6902
ξ0²	18278	16735	10176
η1	8.5688	8.4513	7.7612
η0	-6.8923	+8.2400	-5.8689
η1	+ 371	+ 283	+ 58
η y	28.8414	y 13.7284	y 27.9176
y η	28.8552	η 13.7317	η 27.8631
y-η	+ 138	+ 33	- 545

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MC 966. 1912 Nov. 4, 1912 Nov 26

Standard Coordinates Comparison Stars.
Astro. Journ. - Cambridge Eq. 1875.

Star	1 no.	mag	2 no.	mag	3. no.	mag.
	3805	8.7	3821	8.2	3891	8.0
	x = 25.9	y = 28.1	x = 24.5	y = 13.7	x = 14.5	y = 27.9
α	$7^h\ 04^m\ 38^s.13$		$7^h\ 05^m\ 18^s.17$		$7^h\ 11^m\ 13^s.70$	
Prec to 1911	+ 2 13.13		+ 2 15.09		+ 2 13.06	
1911	$7^h\ 06^m\ 51^s.26$		$7^h\ 07^m\ 33^s.26$		$7^h\ 13^m\ 26^s.76$	
A	7 11 35		7 11 35		7 11 35	
γ-A	− 4 43.74		− 4 01.74		+ 1 51.76	
sin(γ-A)	− 283.72		− 241.73		+ 111.76	
log "	2.452.89 n.		2.384333 n.		2.048.28	
" cos δ	9.995376		9.994620		9.995328	
" S_0	0.913899 n.		0.833677 n.		0.050880	
S_0	−8.2914		−6.8670		+3.2270	
S_1	− 24		− 19		+ 4	
x	25.8998	x	24.4737	x	14.4649	
x S	26.2038	S	24.8689	S	14.7726	
x-S	+ 3040		− 3952		− 3082	

signs of x + y changed.

δ =	+26°	01′	42.2″	+27°	59′	22.9″	+26°	09′ 59.5″
Prec:	−	3	24.2	−	3	26.3	−	3 44.1
1911	+25°	58′	18.0″	+27	55	56.6	+26	06 15.4
D	+26	51	53.	+26	51	53	+26	51 53
δ-D	−	53	35.0	+ 1	04	03.6	−	45 37.6
sin(δ-D)	−	3215.8		+	3844.0		−	2737.8
log "	3.507.22 n.			3.584.78			3.437.40 n.	
" η_0	0.838837 n.			0.915.93			0.768.55 n.	
tan δ	9.6876			9.7244			9.6902	
S_0^2	1.8278			1.6735			1.0176	
η_1	8.5688			8.4513			7.7612	
η_0	−6.8923			+8.2400			−5.8689	
η_1	+ 371			+ 283			+ 58	
η 4	28.8414		4 η	13.7284		4 η	27.9176	
4 η	28.8552		η	13.7317		η	27.8631	
4-η	+ 138			+ 33			+ 545	

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Mc 966 — 1912 Nov. 4.

Star and Coords - Comp. Stars.

	4 No. mag	5 No. mag.	
	a.s. 3943 - 7.9	C 1046 8.8	
	x = 6.0 y = 13.5	x = 4.3 y = 22.5	
α	$7^h\ 16^m\ 09^s.58$	C $7^h\ 18^m\ 38^s.28$	
		L .37	
		E .27	
		mean 7 18 38.31	
Prec.	+ 2 14.76	+ 40.79	
1911	7 18 24 14 ✓	7 19 19.10 ✓	omit
A	7 11 35	7 11 35	uncertain
α-A =	+ 6 49.14 ✓	+ 7 44.10 ✓	identification
sin(α-A) =	+ 409.08 ✓	+ 464.01 ✓	
log "	2.611 81 ✓	2.666 53 ✓	
" cosδ	9.946 07 ✓	9.950 65 ✓	
" ξ₀	1.065 12 ✓	1.124 42 ✓	
ξ₀	+ 11.617 6 ✓	+ 13.317 5 ✓	
ξ₁	+ 59 ✓	+ 56 ✓	
ξ	6.376 5 ✓	4.676 9 ✓	
x	5.978 5 ✓	4.338 14 ✓	
x - ξ	+ 3980 ✓	+ 3455 ✓	

Signs of x + y changed.

δ	+28° 02' 01.9" ✓	C	+26° 49' 18.2"
		L	.4
		E	7
		mean	+26 49 18.4
Prec.	− 3 58.8 ✓	−	1 14.5
1911	+27 58 03.1 ✓	+26	48 039
D	+26 51 53	+26	51 53
δ - D =	+ 1 6 10.1	−	3 49.1
tan(δ-D)	+ 3970.6 ✓	−	229.1
log "	3.599 886 ✓		2.360 05 n
" η₀	0.930 01 ✓		9.691 18 n
tanδ	9.725 1 ✓		9.703 4 ✓
" ξ₀²	2.130 2 ✓		2.248 8
" η₁	8.908 7 ✓		9.005 6
η₀	+8.511 6 ✓		− 0.491 1
η₀	+ 810 ✓		+ 1013
η	13.407 4 ✓		22.389 8
y	13.508 2 ✓		22.499 0
y - η	− 1008 ✓		− 1092

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Star data Coords - Comp. Stars

	4 No.	mag.		5 No.	mag.
a.s.	8943	7.9	C	1046	8.8
	x = -6.0 y = 13.5			x = 43 y = 22.5	
α	7h 16m 09.38		C	7h 18m 38.28	
			L		.37
			E		.27
			Mean	7 18 38.31	
Prec.	+ 2m 14.76			+ 40.79	
1911	7h 18 24.14		7	19 19.10	
A	7 11 35		7	11 35	
α - A	+ 6 49.14		+	7 44.10	
δ (α-A)	+ 409.08		+	464.01	
log"	2.611 81			2.666 53	
" cosδ	9.946 07			9.950 63	
" S.	1.065 12			1.124 42	
S.	+ 11.617 6			+ 13.317 5	
S.	+ 59			+ 56	
ξ	6.376 5			4.676 9	
η	5.978 5			4.381 4	
ξ - S	+ 3980			+ 3455	

Signs of x + y change δ.

δ	+28° 02' 01.9		C	+26° 49' 18.2	
			L		.4
			E		.7
			Mean	+26 49 18.4	
Prec	- 3 58.8			- 1 14.5	
1911	+27 58 03.1			+26 48 03.9	
D	+26 51 53			+26 51 53	
δ - D	+ 1 6 10.1			- 3 49.1	
tan(δ-D)	+ 3970.6			- 229.1	
log"	3.598 86			2.360 05n	
" η₀	0.930 01			9.691 18n	
tanδ	9.725 1			9.703 4	
S.²	2.130 2			2.248 5	
η₁	8.908 7			9.005 6	
η₀	+ 8.511 6			- 0.491 1	
η₂	+ 810			+ 1013	
η	13.407 4			22.389 8	
4	13.508 2			22.499 0	
η - 4	- 1608			- 1092	

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MC 966 1912 Oct 28. 40

comparison stars - measures.

	d		N		d		N	
V	17211		16292		16245		16649	
25.9	8787	84	14699	08	15243	39	7659	36
28.8	85		99		41		42	
	00		90		40		39	
	28.8417		.8410		25.8996		.9001	
2								
24.4	15128		14751		15755		13559	
13.7	7816	26	12018	23	10482	78	8812	16
	20		28		80		08	
	20		46		44		51	
	13.7301		.7273		24.4731		.4743	
3								
14.5	15169		16357		14142		14481	
27.9	5975	79	15521	22	8786	81	9827	34
	80		26		76		29	
	65		51		38		7	
	27.9187		.9167		14.4641		.4646	
4	14125		13899		16419			
5.9	9041	38	8972	74	16208	00	7758	50
13.5	39		73		07		52	
	23		86				7537	
	13.5085		.5088		5.9786		.9784	
5	15140		14143		15318		14161	
4.3	10140	43	9119	20	8632	38	10838	40
22.5	40		22		32		46	
*	28		21		24		48	
	22.4993		.4988		4.3312		.3516	

remeasures.

3	14967		4. direct		2.	13670		
	5675	78				6873	73	
	86					72		
	63					58		
	27.9183					13.7289		

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MC 966 1912 Oct 28. 40

Comparison Stars - measures.

	d		n		d		n	
1	17211		16292		16245		16649	
25.9	8797	84	14699	08	15243	39	7639	36
28.8	85		99		41		42	
	00		90		40		39	
	28.8417		.8410		25.8996		.9001	
2								
24.9	15128		14751		15755		13559	
13.7	7816	26	12018	23	10482	78	8812	16
	20		28		80		08	
	20		46		44		51	
	13.7301		.7273		24.4731		.4743	
3								
14.5	15169		16357		14142		14481	
27.9	5975	79	15521	22	8786	81	9827	34
	80		26		76		29	
	65		51		38		71	
	27.9187		.9167		14.4641		.4646	
4	14125		15899		16419			
5.9	9041	38	8972	74	16208	00	7758	50
13.5	39		73		07		52	
	23		86				7537	
	13.5085		.5086		15.9786		.9784	
5	15140		14143		15318		14161	
4.3	10140	43	9119	20	8632	38	10838	40
22.5	40		22		32		56	
v	28		21		24		48	
	22.4993		.4988		.3312		.5316	

Remeasures.

3	14967	4	direct	13670	
	5675	78		6373	73
	86			72	
	63			58	
	27.9183			13.7289	

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Points on moon's limb - measures.

V	a	n	remeasure direct
19.0	15998	14703	15321
20.1	12984589	7645558	12326220
	8388	4554	2121
	88	87	08
	20.3009	.2959	20.2995
2/			
19.1	14988	13710	
20.3	12030019	6641140	
4=	1929	3841	
mean	80	99	
	20.2964	.2938	
3/			
20.0	14949	16101	
20.5	9901000	11119124	
	0000	2131	
	38	79	
	20.5043	.5034	
4/			
21.0	16321	15222	
21.5	11234271	10309944	
	1515	0414	
	17	12	
	21.5096	.5088	
5/			
21.0	16035	15062	
23.3	13294660	7735535	
	7671	1556	
	22	62	
	23.2754	.2673	
6/			
20.0	14982	14983	
24.4	12120188	7808120	
	1930	0011	
	72	83	
	24.2857	.2825	

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Points on Moon's limb - measures.

V	a	n	measure direct
	4		
19.0	15998	14703	15321
20.4	1298489	764558	1232620
	9388	4154	2121
	88	87	08
	20.3009	.2959	20.2995
2/			
19.1	14988	13710	
20.3	1203019	664140	
	1929	3841	
	80	99	
	20.2964	.2938	
3/			
20.0	14949	16101	
20.5	9901100	11119124	
	0000	2131	
	38	79	
	20.5043	.5034	
4/			
21.0	16321	15222	
21.5	1123427	1030994	
	1515	0414	
	17	12	
	21.5096	.5088	
5			
21.0	16035	15062	
23.3	13294666	773535	
	7671	1556	
	22	62	
	23.2754	.2673	
6/			
20.0	14982	14983	
24.4	1212018	7808 12	
	1930	0011	
	72	83	
	24.2857	.2825	

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MC966 1912 Oct 29. 42

Points on Moon's limb - Measures.

	d	n
b		
20.7	15099	14839
21.0	1173926	814867
	3338	6467
	79	26
	20.6641	.6668
8		
21.2	14311	14523
22.0	584038	1297261
	3836	6574
	98	17
	21.1538	.1554
9		
21.2	14275	14542
22.4	622539	1255238
x=	2931	4241
max	60	41
	21.1968	.1999
10		
21.1	17205	15561
23.0	826541	1452110
	4841	1920
	98	58
	21.1050	.1043
11		
20.5	15919	14440
24.0	1035847	1002111
	4948	2308
	09	35
	20.4437	.4422

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MC966 - 1912 Oct 29.

Points on Moon's Limb - Measures.

		d	x N
Z			
20.7		15099	14839
21.0		1173926	814867
		3338	6467
		79	26
		20.6641	.6668
8			
21.2		14311	14523
22.0		584038	1297261
		3836	6574
		98	17
		21.1538	.1554
9			
21.2		14275	14542
23.4		622539	1255238
x =		2931	4241
max		60	41
		21.1968	.1949
10			
21.1		17205	15561
25.0		826541	1452110
		4841	1920
		98	58
		21.1050	.1043
11			
20.5		15919	14440
24.0		1035847	1002111
		4948	2308
		09	35
		20.4437	.4422

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MC966 1912 Nov. 5.

Mean measured coords of comp. stars and coords. of center of plate

Star	x	y	R.A.	Decl.
1	25.8998	28.8414	7h 6m 51s	25 58 18
2	24.4737	13.7284	7 33	27 55 57
3	14.4644	27.9176	13 27	26 6 15"
4	5.9785	13.5082	18 24	27 58 3
5	4.3514	22.4990	19 19 ✓	26 48 4 ✓
5 [	75.15 ✓	106.49 ✓	65 34 ✓	34 46 37 ✓
	15.03	21.30	7h 13m 07s	26° 57' 19"
	- 18.	-22.00	- 1 32	- 5 26
	- 2.97	0.70	7h 11m 35s	+26° 51' 53"
	31	465		
	297	325.5	A = 7h 11m 35s	} center of plate
	891	5' 26"	D = +26° 51' 53"	
	92.07			

Preliminary Reduction.

x - 3	+ 604		+ 2x	- 4810
+ 3040	+ 1730	= + 4770	+ 52 = + 4822	= + 12
+ 3952	+ 824	= + 4776	+ 49 = + 4825	= + 15
+ 3082	+ 1675	= + 4757	+ 29 = + 4786	= - 24
+ 3980	+ 810	= + 4790	+ 12 = + 4802	= - 8
+ 3455	+ 1350	= + 4803	+ 9 = + 4814	= + 4 reject
-19.0984	+ 1344 ✓		+ 38 =	= - 19.4412 ✓

y - 4	- 607x		+ 4x	+ 1333
+ 138	- 1554	= - 1416	+ 104 = - 1312	= + 21
+ 33	- 1468	= - 1435	+ 97 = - 1338	= - 5
- 545	- 868	= - 1413	+ 57 = - 1356	= - 23
- 1008	- 359	= - 1367	+ 24 = - 1343	= - 10
- 1092	- 260	= - 1352	+ 17 = - 1315	= + 18 reject.
-22.3924	- 1146		+ 76	= - 22.3661 ✓
	- 1166		+ 78	

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Mean measured coords of comp. stars and coords. of center of plate

star	x	y	R.A.	Decl.
1	25.8998	28.8414	7h 6m 51s	25 58 18
2	24.4737	13.7284	7 33	27 55 57
3	14.4644	27.9176	13 27	26 6 15
4	5.9785	13.5082	18 24	27 58 3
5	43314	22.4990	19 19	26 48 4
	5 | 75.15	10649	65 34	34 46 37
	15.03	21.30	7h 13m 07s	26° 57' 19"
	-1K	-22.00	- 1 32	- 5 26
	2.97	0.70	7h 11m 35s	+26° 51' 53"
	31	4.65		
	297	325.5	A = 7h 11m 35s	
	891	5' 26"	D = +26° 51' 53"	} center of plate
	92.07			

Preliminary Reductions

x-3	+604		+2x	-4810
+3040	+1730	+4770	+52 : +4822	= +12
+3952	+824	: +4776	+49 : +4825	: +15
+3082	+1673	: +4757	+29 : +4786	: -24
+3780	+810	: +4790	+12 : +4802	: -8
+3455	+1350	: +4803	+9 : +4812	: +4
x -19.0984	+1344		+38 =	: -19.4412

y-y	-607		+4x	+1333
+138	-1554	: -1416	+104 : -1312	: +21
+33	-1468	: -1435	+97 : -1338	: -5
-545	-868	: -1413	+57 : -1356	: -23
-1008	-359	: -1367	+24 : -1343	: -10
-1092	-260	: -1352	+17 : -1315	: +18
y -22.3924	-1146		+76	: -22.3661

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Times etc.

Exp. to stars	1911 Mar 9	7^h	48^m		to	8^h	00^m	
" to moon		7	54	26.3		7	54	26.5
Clock fast			2	36.8				
H. Sid. Time		7^h	51^m	49.6				
H. Long		4	44	31.05				
G. Sid Time		12	36	20.65				
Sid T Mean Noon		23	04	13.82				
Interval		13	32	06.83				
Reduction		–	2	13.05				
G.M.T.		13	29	53.78				

From Am Eph.		R.A.			Decl.		
Moon 13^h		7^h	10^m	01.56	+27°	06′	30.″2
Motion in 1^m	2.6097			3890			
" " 29.90		1	18.02		–	1′	26.4
Tabular place		7^h	11^m	19.58	+27	05	03.8

Moon's parallax	58′	50.″8
" semidiam	16′	03.″6

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Times etc.

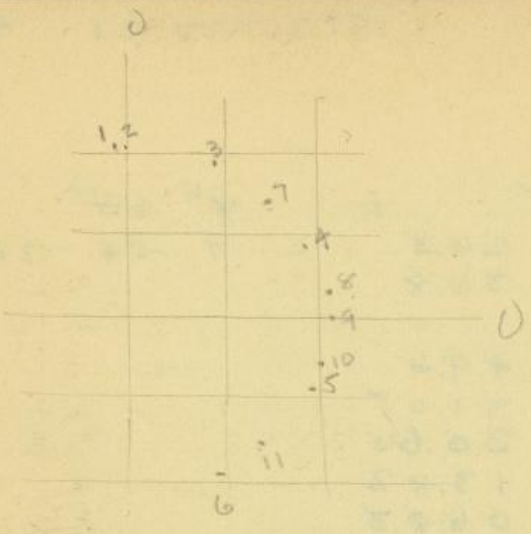
Exp. to Stars	1911 Mar 9	7^h	48^m		to 8^h	00^m
" Moon		7	54	26.3	7	54 26.5
Clock fast			2	36.8		
M. Sid. Time		7^h	51^m	49.6		
M. Long.		4	44	31.05		
G. Sid. Time		12	36	20.65		
Sid. Time Noon		23	04	13.82		
Interval		13	32	06.83		
Reduction		–	2	13.05		
G.M.T.		13	29	53.78		

		R.A.			Decl.		
From Am. Eph.							
Moon 13^h		7^h	10^m	01.56	$+27°$	06′	30.2
Motion in 1^m	2.60849		1		2935		
" " 29.90		1	18.07		–	1′	26.4
Tabular place		7^h	11^m	19.58	+27	05	03.8

Moon's parallax	58′	50.″8
" semidiam.	16′	03.6

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Point	Pos. L	Resid.
6	205°4	-14
11	220.0	-6
5	245.3	-42
10	253.2	+11
9	270.0	+171
8	280.8	-111
4	295.0	+31
7	311.8	+13
3	334.6	-134
2	0.0	+56
1	2.5	+31

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MC966. 1912 Nov. 23. 45

Moon's Center.

Point	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	(o-c)
1	19.00000	+0.0995	0.0099	4.4031	+119
2	19.09995	0.0000	0.0000	4.4054	+142
3	20.0000	−0.9005	0.8109	4.3838	−74
4	21.0000	−1.9005	3.6119	4.3948	+36
5	21.0000	−1.9005	3.6119	4.3817	−95
6	20.0000	−0.9005	0.8109	4.3834	−78
7	20.6654	−1.5659	2.4521	4.3953	+41
8	21.1546	−2.0551	4.2234	4.3786	−126
9	21.1984	−2.0989	4.4054	4.4054	+142
10	21.1046	−2.0051	4.0204	4.3876	−36
11	20.4430	−1.3435	1.8050	4.3842	−70
				4.3912	+1

Signs of x + y changed.

Point	y	$y - Y_0$	$(y-Y_0)^2$
1	20.2980	+2.0960	4.3932
2	20.2951	+2.0989	4.4054
3	20.5038	+1.8902	3.5729
4	21.5092	+0.8848	0.7829
5	23.2714	−0.8774	0.7698
6	24.2841	−1.8901	3.5725
7	21.0000	+1.3940	1.9432
8	22.0000	+0.3940	0.1552
9	22.3940	0.0000	0.0000
10	23.0000	−0.6060	0.3672
11	24.0000	−1.6060	2.5792

Phot. center of moon.

x = 20 y = 20.5038
24.2841
44.7879
mean Y = 22.3940
y = min 20.2951
R = 2.0989
x = max = 21.1984
X_0 = 19.0995

x = 21.0 y = 21.5092
23.2714
44.7806
mean Y = 22.3903

Assume $X_0 = 19.0995$, $Y_0 = 22.3940$

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MC 966. 1912 Nov. 23. 45

Nucleus Center.

Point	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	$(o-c)$
1	19.0000	+0.0995	0.0099	4.4031	+119
2	19.0995	0.0000	0.0000	4.4054	+142
3	20.0000	−0.9005	0.8109	4.3938	−74
4	21.0000	−1.9005	3.6119	4.3948	+36
5	21.0000	−1.9005	3.6119	4.3817	−95
6	20.0000	−0.9005	0.8109	4.3834	−78
7	20.6654	−1.5659	2.4521	4.3953	+41
8	21.1546	−2.0551	4.2234	4.3786	−126
9	21.1984	−2.0989	4.4054	4.4054	+142
10	21.1046	−2.0051	4.0204	4.3876	−36
11	20.4430	−1.3435	1.8050	4.3942	−70
				4.3912	+1

Signs of x + y changed.

Point	y	$y - Y_0$	$(y-Y_0)^2$
1	20.2980	+2.0960	4.3932
2	20.2951	+2.0989	4.4054
3	20.5038	+1.8902	3.5729
4	21.5092	+0.8848	0.7829
5	25.2714	−0.8774	0.7698
6	24.2841	−1.8901	3.5725
7	21.0000	+1.3940	1.9432
8	22.0000	+0.3940	0.1552
9	22.3940	0.0000	0.0000
10	23.0000	−0.6060	0.3672
11	24.0000	−1.6060	2.5792

Approx. center of moon.

$x = 20$ $y = 20.5038$
24.2841
44.7879
mean $Y = 22.3940$
$y = \min$ 20.2951
$R = 2.0989$
$x = \max = 21.1984$
$X_0 = 19.0995$

$x = 21.0$ $y = 21.5092$
23.2714
44.7806
mean $Y = 22.3903$

Assume $\begin{cases} X_0 = 19.0995 \\ Y_0 = 22.3940 \end{cases}$

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Formation of Normal Equations

No	aa	ab	ac	bb	bc	bw.
1	+ 0.21	+ 11.9		+ 249.9		
2	0.00	0.0		+ 298.2		
3	- 1.70	+ 66.6		- 139.9		
4	- 1.67	- 68.4		+ 31.7		
5	+ 1.67	+ 180.5		+ 83.6		
6	+ 1.70	+ 70.2		+ 147.4		
7	- 2.18	- 64.4		+ 57.0		
8	- 0.80	+ 259.6		- 49.1		
9	0.00	- 298.2		0.0		
10	+ 1.22	+ 72.4		+ 22.0		
11	+ 2.16	+ 93.8		+ 112.7		
	+ 0.61	+ 324.0		+ 813.5		

[aa] = +25.75 [bb] = +22.53

[ac] = -14.58 [bc] = +3.76 [cw] = +1

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MC966. 1912 Dec. 6. 46

Moon's center.

Conditional Equations

	a	b	c	O				C	O − C
1	+0.10	+2.10	+ 1	= +119	+	2+68	+ 18	= +88	+31
2	0.00	+2.10	+ 1	= +142		0+68	+ 18	= +86	+56
3	−0.90	+1.89	+ 1	= −74	−	20+62	+ 18	= +60	−134
4	−1.90	+0.88	+ 1	= +36	−	42+29	+ 18	= + 5	+31
5	−1.90	−0.88	+ 1	= −95	−	42−29	+ 18	= −53	−42
6	−0.90	−1.89	+ 1	= −78	−	20−62	+ 18	= −64	−14
7	−1.57	+1.39	+ 1	= +41	−	35+45	+ 18	= +28	+13
8	−2.06	+0.39	+ 1	= −126	−	46+13	+ 18	= −15	−111
9	−2.10	0.00	+ 1	= +142	−	47+0	+ 18	= −29	+171
10	−2.01	−0.61	+ 1	= −36	−	45−20	+ 18	= −47	+11
11	−1.34	−1.61	+ 1	= −70	−	30−52	+ 18	= −64	−6

+313 −307

Average O−C: 56

Normal Equations.

a	b	c	
+25.75	+0.61	−14.58	= +324
+0.61	+22.53	+3.76	= +814
−14.58	+3.76	+11.00	= +1
−0.61	−0.01	+0.35	= −8
+14.58	+0.35	−8.24	= +183
	+22.52	+4.11	= +806
	+4.11	+2.76	= +184
	−4.11	−0.75	= −147
		+2.01c	= +37
	−5.91	−4.11	= −265
	+16.61b		= +541
−19.32	+4.99	+14.58	= +1
+4.99	−1.29	−3.76	= −0
+6.43	+5.60		= +325
+5.60	+21.24		= +814
−1.47	−5.60		= −214
+4.96a			= +111
−9486		+541c	= —

$\frac{\Delta\delta}{\Delta\alpha}$ = 2.10 − .18 = −

c = +18

b = +33

a = +22

$\frac{\Delta\alpha}{\Delta\alpha}$ = 2.10 + .57 = +1.20

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Woodwisconsin.

Conditional equations

	a	b	c	O	c	O − C
1	+0.10	+2.10	+ 1	= +119	+ 2+68+18 = +88	+ 31
2	0.00	+2.10	+ 1	= +142	0+68+18 = +86	+56
3	−0.90	+1.89	+ 1	= −74	− 20+62+18 = +60	−134
4	−1.90	+0.88	+ 1	= +36	− 42+29+18 = + 5	+31
5	−1.90	−0.88	+ 1	= −95	− 42−29+18 = − 53	−42
6	−0.90	−1.89	+ 1	= −78	− 20−62+18 = − 64	−14
7	−1.57	+1.39	+ 1	= +141	− 35+45+18 = +28	+113
8	−2.06	+0.39	+ 1	= −126	− 46+13+18 = − 15	−111
9	−2.10	0.00	+ 1	= +142	− 47+ 0+18 = − 29	+171
10	−2.01	−0.61	+ 1	= −36	− 45−20+18 = − 47	+11
11	−1.34	−1.61	+ 1	= −70	− 30−52+18 = − 64	− 6

+313 −307

Normal Equations.

a	b	c	
+25.75	+10.61	−14.58	= +324
+ 10.61	+22.53	+ 3.76	= +814
−14.58	+ 3.76	+11.00	= +4
− 10.61	− 0.01	+ 0.35	= − 8
+14.58	+ 0.35	− 8.24	= +183
	+22.52	+ 4.11	= +806
	+ 4.11	+ 2.76	= +184
	− 4.11	− 0.75	= −147
		+ 2.01c	= +37
	−15.91	− 4.11	= −265
	+16.61b		= +541

$\frac{\Delta S}{\Delta a} = 210 - .14 = -$

c = +18

b = +33

−19.32	+ 4.99	+14.58	= + 1
+ 4.99	− 1.29	− 3.76	= − 0
+ 6.43	+ 5.60		= +325
+ 5.60	+21.24		= +814
− 1.47	− 5.60		= −214
+ 4.96a			= +111

a = + 22

−9481 +541c = — $\frac{\Delta R}{\Delta c} = 210 + 31 = 180$

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Moon's mean position (1911.0)

$X_0 = -19.0995$ $\quad Y_0 = -22.3940$

$+\frac{1}{2}a = +11$ $\quad +\frac{1}{2}b = +16$

$X = -19.0984$ $\quad Y = -22.3924$

From precise Reductions $X = -19.4412$ $\quad Y = -22.3661$

∴ computed plate constants $ax = +39$ $\quad +32$

$by = -30$ $\quad -13$

$c = -9$ $\quad -31$

$X = -19.4412$ $\quad Y = -22.3663$

$\xi = -1.4412$

$\log = 0.158772_n$

$-\cos\delta = 9.950597$

8.507724

$\log(\alpha - A) = 1.700897$

$\alpha - A = -5^s 0.27$

$A = 7^h 11^m 35^s$

$\alpha_0 = 7^h 10^m 44^s.78$

$\eta = -0.3663$

$\log\tan = 9.70477$

$\therefore \xi^2 = 0.31773$

$\therefore \cos\delta = 70534$

$\therefore \eta_1 = 7.07754$

$\eta_1 = +12$

$\eta_0 = -0.3675$

$\log\eta_0 = 9.56526$

$\therefore \cos\delta = 7.33115$

$\log(\delta - D) = 2.23411_n$

$\delta - D = -171.4$

$-2\ 51.4$

$D = +26\ 51\ 53$

$\delta_0 = +26^\circ\ 49'\ 01''.6$

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MC 166 1912 Dec 16

Wrong linear solution (1911 0)

$X_0 = -19.0995$ $Y_0 = -22.3940$

$+ 11$ $+ 16$

$X = -19.0984$ $Y = -22.3924$

From graphic Reduction $X = -19.4412$ $Y = -22.3661$

∴ computed plate constants are: $+ 39$ $+ 13$

$- 38$ $- 16$

$+ 72$ $+ 5$

$X = -19.4410$ $Y = -22.3659$

$\xi = -1.4410$

$\log a = 0.15866_n$

$\cos\delta = 9.95059$

8.50724

$(\alpha - A)\ 1.700893$

$\alpha - A = - 50^s.21$

$A = 7^h\ 11^m\ 35^s$

$\alpha_0 = 7^h\ 10^m\ 44^s.79$

$\eta = -0.3659$

$\log a = 9.70477$

$\xi^2 = 0.31734$

$\log D = 7.05334$

$\eta_1 = 7.07544$

$\eta_1 = + 12$

$\eta_0 = -0.3671$

$\log \eta_0 = 9.56478_n$

$\operatorname{Cotan}\delta = 7.53115$

$\log(\delta - D) = 2.23363_n$

$\delta - D = - 171.2$

$- 2\ 51.2$

$D = +26.\ 51\ 53$

$\delta_0 = +26^\circ\ 49'\ 01''.8$

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MC966 Comparison Stars. 1912 Nov. 29.

Plate Constants.

Conditional Equations.

a	b	c			
+28.90	+28.84	+1 = +12	+13	+21	+25
+24.47	+13.73	+1 = +15	+16	−5	−1
+14.46	+24.92	+1 = −24	−23	−23	−19
+5.98	+13.81	+1 = −8	−7	−10	−6
+4.33	+22.50	+1 = +4		+18	

Mean Equations

+26.64	+21.28	+1 =	+13.50	+8.00
+8.26	+21.31	+1 =	−9.33	−5.00
+21.68	+28.38	+1 =	−6.00	−1.00
+11.59	+16.58	+1 =	+3.66	+1.00
+18.38	−0.03	=	+22.83	+13.00
+10.09	+11.80	=	−9.66	−2.00
−10.09	+0.02	=	−12.53	−7.16
	+11.82	=	−22.19	−9.16
		b =	−1.87	−0.77

+18.38a = +22.83 − 0.06 = +22.77 = +13.00 − 0.02 = +12.98

a = +1.24 +0.71

+13.5	−9.3	−6.0	+3.7	+8.0	−5.0	−1.0	+1.0
−33.1	−10.2	−26.9	−13.8	−1.89	−5.9	−15.4	−8.8
+39.8	+39.8	+52.9	+30.9	+1.64	+1.64	+21.8	+12.7
+20.2	+20.3	+20.0	+20.8	+5.5	+5.5	+15.4	5.5

c for x − Ξ

c for η − η

Residuals in x. C O O − C

1	+36	−54	+20	= +2	+12	+10
2	+29	−26	+20	= +23	+15	−8
3	+18	−52	+20	= −14	−24	−10
4	+7	−25	+20	= +2	−8	−10
5	+5	−42	+20	= −17	+4	+21

Residuals in η

1	+21	−22	+5	= +4	+21	+17
2	+17	−11	+5	= +11	−5	−16
3	+10	−21	+5	= −6	−23	−17
4	+4	−10	+5	= −1	−10	−9
5	+3	−17	+5	= −9	+18	+27

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MC966 Comparison Stars. 1912 Nov. 29.

Plate Constants

Conditional Equations

a	b	c	
+28.90	+28.84	+1 = +12	+21
+24.47	+13.73	+1 = +15	−5
+14.46	+24.92	+1 = −24	−23
+5.98	+13.51	+1 = −8	−10
+4.33	+22.50	+1 = +4	+18

Mean Equations

+26.64	+21.28	+1 =	+13.50	+8.00
+8.26	+21.31	+1 =	−9.33	−5.00
+21.68	+28.38	+1 =	−6.00	−1.00
+11.59	+16.58	+1 =	+3.66	+1.00
+18.38	−0.03	=	+22.83	+13.00
+10.09	+11.80	=	−9.66	−2.00
−10.09	+0.02	=	−12.53	−7.16
	+11.82	=	−22.19	−9.16
		b =	−1.87	−0.77

+18.38a + 22.83 − 0.06 + 22.77 : +13.00 − .02 = +12.98

a = +1.24 +0.71

+13.5	−9.3	−6.0	+3.1	+8.0	−5.0	−1.0	+1.0
33.1	−10.2	−26.9	−13.8	−189	−5.9	−15.4	−8.8
39.8	+39.8	+52.9	+30.9	+164	+164	+21.8	+12.7
+20.2	+20.3	+20.0	+24.8	+55	+55	−15.4	5.5

c for x = 5 c for y = 9.

Residuals

	x	y	C	O	O − C
1	−36	−5.4	+20 =	+2	+12	+10
2	−29	−26	+20 =	+23	+15	−8
3	+18	−52	+20 =	−14	−24	−10
4	+7	−25	+20 =	+2	−8	−10
5	+5	−42	+20 =	−17	+4	+21

Residuals − 7

1	+21	−22	+5 =	+4	+21	+17
2	+17	−11	+5 =	+11	−5	−16
3	+10	−21	+5 =	−6	−23	−17
4	+4	−10	+5 =	−1	−10	−9
5	+3	−17	+5 =	−9	+18	+27

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MC966. Stars. 1912 Dec 4.

Plate constants.
omitting the uncertain 5th star.

Condional Equations.

a	b	c	
+25.90	+28.84	+1 = +12	+21
+24.47	+13.73	+1 = +15	− 5
+14.46	+27.92	+1 = −24	−23
+ 5.98	+13.51	+1 = − 8	−10

Mean Equations.

+25.18	+21.28	+1 = +13.50	+ 8.00
+10.22	+20.72	+1 = −16.00	−16.50
+20.36	+28.38	+1 = − 6.00	− 1.00
+15.22	+13.62	+1 = + 3.50	− 7.50
+14.96	+ 0.56	= +29.50	+24.50
+ 5.14	+14.76	= − 9.50	+ 6.50
−	− 0.19	= −10.12	− 8.39
	+14.57	= −19.62	− 1.89
	b	= − 1.35	− 0.13

+14.96 = +29.50 + 0.75 = +30.25 +24.50 + 0.07 = +24.57
a = + 2.03 + 1.64

+13.5	−16.0	− 6.0	+ 3.5	+ 8.0	−16.5	− 1.0	− 7.5
−51.1	−20.7	−41.3	−30.6	−41.4	−16.8	−33.4	−24.8
+28.8	+28.0	+38.2	+18.4	+ 2.8	+ 2.7	+ 3.7	+ 1.8
− 8.8	− 8.7	− 9.1		−30.6	−30.6	−30.7	−30.5

c from x − 8 c from 4 − 9.

Resids in x.

				O − C
+53	−39	−9 = +5	+12	= +7
+50	−18	−9 = +23	+15	= −6
+29	−38	−9 = −18	−24	= −6
+12	−18	−9 = −15	− 8	= +7

Resids in 4

+42	− 4	−31	= +7	+21	= +14
+40	− 2	−31	= +7	− 5	= −12
+24	− 4	−31	= −11	−23	= −12
+10	− 2	−31	= −23	−10	= +13

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MC966. 1912 Dec 4.

Probable Errors
Omitting the uncertain 5th star.

Conditional Equations

a	b	c	
+ 28.90	+ 28.84	+ 1 = + 12	+ 21
+ 24.47	+ 13.73	+ 1 = + 15	− 5
+ 14.46	+ 27.92	+ 1 = − 24	− 23
+ 5.98	+ 13.51	+ 1 = − 8	− 10

Mean Equations.

+ 26.64	+ 21.28	+ 1 = + 13.50	+ 8.00
+ 10.22	+ 20.72	+ 1 = − 16.00	− 16.50
+ 21.68	+ 28.38	+ 1 = − 6.00	− 1.00
+ 15.22	+ 13.42	+ 1 = + 3.50	− 7.50
+ 16.42	+ 0.56	= + 29.50	+ 24.50
+ 6.46	+ 14.76	= − 9.50	+ 6.50
− 6.46	− 0.22	= − 11.60	− 9.64
	+ 14.54	= − 21.10	− 3.14
	b	= − 1.45	− 0.22

+ 16.42 = + 29.50 + 0.81 = + 30.31 + 24.50 + 0.12 = + 24.62

a = + 1.84 + 1.50

+ 13.5	− 16.0	− 6.0	+ 3.5	+ 8.0	− 16.5	− 1.0	− 7.5
− 49.0	− 18.6	− 39.9	− 27.7	− 39.9	− 13.3	− 32.5	− 22.8
+ 30.8	+ 30.0	+ 41.1	+ 19.7	+ 4.7	+ 4.5	+ 6.2	+ 3.0
− 4.7	− 4.6	− 4.8	− 4.5	− 27.2	− 27.3	− 27.3	− 27.3

c from a = − 5 c from 4 − 7.

Residuals.

				O − C
+ 53	− 42	− 5	= + 6	+ 12 = + 6
+ 45	− 20	− 5	= + 20	+ 15 = − 5
+ 26	− 40	− 5	= − 19	+ 24 = − 5
+ 11	− 20	− 5	= − 14	− 8 = + 6

Residuals 4.

+ 43	− 6	− 27	= + 10	+ 21	= + 11
+ 37	− 3	− 27	= + 7	− 5	= − 12
+ 22	− 6	− 27	= − 11	− 23	= − 12
+ 9	− 3	− 27	= − 21	− 10	= + 11

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MC 966. (1911 Mar. 9.7h) Moon. 1912 Dec. 17. 50

Reduction to apparent place.

$\alpha_0 = 7^h\ 10^m\ 44^s.79$ $\quad \delta_0 = +26^\circ\ 49'\ 01''.8$

$G = 17\ 42\ 36$ $\quad H = 18^h\ 49^m\ 12^s$

$G + \alpha_0 = 0\ 53\ 21 = 13^\circ\ 20'$ $\quad H + \alpha_0 = 1^h\ 59^m\ 57^s = 29^\circ\ 59'$

$\log \frac{1}{\Delta}$	8.8239	$\log \frac{1}{\Delta}$	8.8737
$\therefore q$	0.8583	$\therefore h$	1.2747
$\therefore \sin(G+\alpha)$	9.3629	$\therefore \sin(H+\alpha)$	9.6987
$\therefore \tan \delta_0$	9.7037	$\therefore \sec \delta$	0.0494
$\log(q)$	87488	$\therefore (R)$	9.8467

$\log q$	0.8583	$\log h$	1.2747
$\therefore \cos(G+\alpha_0)$	9.9881	$\therefore \cos(H+\alpha_0)$	9.9376
$\therefore (q')$	0.8464	$\therefore \sin \delta_0$	9.6543
		$\therefore (h')$	0.8666

$\log i = 0.9020_n$

$\therefore \cos \delta_0 = 9.9506$

$\log(i) = 0.8526_n$

f	-0.086	(q')	$+7.02$
(q)	$+0.056$	(h)	$+7.35$
(R)	$+0.703$	(i)	-7.12
Red in α	$+0.673$ ✓	Red in δ	$+7.25$ ✓

$\alpha_0 = 7^h\ 10^m\ 44^s.79$ $\quad \delta = 26^\circ\ 49'\ 01''.6$ ✓

$\alpha' = 7\ 10\ 45.45$ ✓ $\quad \delta' = +26^\circ\ 49'\ 08''.8$ ✓

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MC 966. (1911 Mar. 9. 7h) Micro 1912 Dec. 17. 50

Reduction to apparent place.

α_0 = 7h 10m 44.79 δ_0 = +26° 49′ 01.8

G = 17 +2 36 H = 18h 49m 12s

$\tau + \alpha_0$ = 0 53 21 $H + \alpha_0$ = 1h 59m 57s = 29° 59′

= 13° 20′

log $\frac{1}{15}$ = 8.8239 log $\frac{1}{15}$ = 8.8239

g_8 = 0.8583 ∴ h = 1.2747

sin(G+α) = 9.3629 sin(H+α) 9.6987

tan δ_0 = 9.7057 sec δ = 0.0494

log(g_8) 8.7488 (R) 9.8467

log g_8 = 0.8583 log h 1.2747

cos(G+α) 9.9881 ∴ sin(H+α) 9.9376

(g_8') = 0.8464 sin δ_0 9.6543

(h') = 0.8666

log i = 0.9020 n

∴ sin δ_0 = 9.9506

log(i) = 0.8526 n

f = −0.086 (g_8') = +7.02

(g) = +0.056 (h) = +7.35

(k) = +0.703 (i) = −7.12

Red − α = +0.673 Red − δ = +7.25″

α_0 7h 10m 44.79 δ_0 +26° 49′ 01.8

α 7 10 45.46 δ +26° 49′ 09.0

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MC 966 (1911 Mar 9.) 1912 Dec. 17. 51

Lunar Parallax.

α' = 7h 10m 45s.45 ✓
Θ = 7 51 49.6 ✓

$\Theta - \alpha'$ = + 41m 04s.15 ✓
= + 10° 16' 02" ✓

$\frac{1}{2}(\Theta - \alpha')$: + 4 21 ✓
$(\Theta + \alpha') - \frac{1}{2}(\alpha - \alpha')$: + 10 11 41 ✓

log tan ϕ' = 9.95727 ✓
∴ cos $(\alpha - \alpha')$ = 0.00000
∴ cos $(\Theta - \alpha') - \frac{1}{2}(\alpha - \alpha')$ 9.99309 ✓
∴ tan χ = 9.96418 ✓

χ : + 42° 38' 24" ✓
δ' : + 26 49 08.8
$\chi - \delta'$ = 15 49 15.2
log $\rho \sin \phi'$ = 9.87640 ✓
∴ sin π = 8.23343 ✓
∴ sin $(\chi - \delta')$: 9.43557 ✓
∴ sin χ = 9.83084 ✓

∴ sin $(\xi - \delta')$: 7.66456 ✓

$\xi - \delta'$ = + 15 52.8 ✓

ξ = + 27 05 01.6 ✓

Am Eph ξ = + 27° 05' 03.8" ✓

O − C = − 2.2

Corr to Standard reading 0.0

δ' = + 26° 49' 08.8" ✓

π = 58' 50.8" ✓

log $\rho \cos \phi'$ = 9.86913 ✓
∴ sin π = 8.23343 ✓
∴ ∴ cos $(\Theta - \delta')$ = 9.25100 ✓
∴ cos δ' = 9.95058 ✓

∴ sin $(\alpha - \alpha')$: 7.40298 ✓

Approx $(\alpha - \alpha')$: + 8' 41.7 ✓

log cos δ 9.94956 ✓
∴ sin $(\alpha - \alpha')$: 7.40400 ✓

$\alpha - \alpha'$ = 8' 42.9" ✓
= + 34s.86 ✓

α: 7 11 20.31 ✓

α = 7h 11m 19.58s ✓

+ 0.73 ✓

Corr to Standard reading 0.0

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VIC 966 (1911 Mar 9.) 1912 Dec. 17.

Lunar Parallax.

$x' = 7^h\ 10^m\ 45^s.45$
$\Theta = 7\ 51\ 49.6$

$\Theta - x' = +\ 41^m\ 04^s.14$
$= +\ 10^\circ\ 16'\ 02''$

$\frac{1}{2}(\Theta - x')$: + 4 21
$-\frac{1}{2}(x - x')$: + 10 11 41

log tan φ' = 9.95727
∴ cos(α - α') = 0.00000
∴ cos(Θ - x') · ½(x - x') 9.99309
∴ tan ζ = 9.96418

ζ = 42° 38' 24"
δ' = + 26 47 09
δ - δ' = 15 49 15
log sin φ' = 9.87640
∴ sin T' = 8.23343
∴ sin (ζ - δ') = 9.43557
∴ sin ζ = 9.83084

sin (δ - δ') = 7.66456

δ - δ' = + 15 52.8

δ = + 27 05 01.8

Corr to Eph δ = + 27° 05' 03".8

O - C = - 0".6

Corr to Hand 2 adopted 0.0

δ' = + 26° 49' 09".0

T' = 58' 50".8

log √cos φ' = 9.86913
∴ sin T' = 8.23343
∴ ∴ (Θ - φ') = 9.25100
∴ cos δ' = 7.95058

∴ sin (α - α') = 7.40298

Approx (α - α') = + 8' 41.7

log cos δ 9.94956
∴ sin (α - α') 7.40400

α - α' = 8' 42.9
= + 534.86

α = 7^h 11^m 20.31

α = 7^h 11^m 19.58

+ 0.73

0.0

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MC966 1913 April 5. 52

Moon-Measures. More points. Reseau reversed.

	d		y	N		d		N
1/	16585		15311	15.5		15751		16441
16.0	94	35	1245640	20.0		113192	1	10840 57
19.6	26		3930			31		57 57
	80		16			62		30
	19.7150		.7129			15.5568		.5585
3/	scratch							
15.1								
20.5	19351		19083			15395		15401
	14239	34	14218	11		646045		14292 60
	36		10			5053		04
	56		95			51		08
	20.5118		.5124			15.1102		.1103
4/								
14.9						18501		18957
21.0						17429	26	9991 98
						25		80
						00		40
						14.8926		.8951
5/	scratch							
14.8	16238		16823			17481		17961
21.2	146213	0	84394	0		15985	90	94595 2
	21		39			90		60
	48		18			66		55
	21.1616		.1620			14.8506		.8499
6/								
14.8						17370		17270
21.6						1536066		92607 5
						62		66
						65		65
						14.7994		.7999
7/	scratch							
14.8	15340		14359			16687		16266
21.8	74808	5	1223020			14790	82	81507
	87		28			84		60
	31		55			91		66
	28.7649		.7868			14.8097		.8110

Remeasure
= 28.7859

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MC966 1913 April 5. 52

Moon - Remeasures - More points. Reseau reversed.

	d	y	N	x	d	N
1/	16585	15311		15.5	15751	16441
16.0	94355	1245640		20.0	113192	1084053
19.6	26	3930			31	57
	80	16			62	30
	19.7150	.7129			15.5568	.5585
3/	scratch					
5.1						
10.5	19351	19083			15345	15401
	142397	1421811			646045	1429200
	36	10			5053	04
	56	95			51	08
	20.5118	.5124			15.1102	.1103
4/						
4.9					18501	18957
21.0					174792	9991
					25	80
					60	40
					14.8926	.8951
5/	scratch					
14.8	16238	16823			17481	17961
21.2	1462130	843940			15985	94595
	21	39			90	60
	48	18			86	55
	21.1616	.1620			14.8506	.8499
6/						
14.8					17370	17270
16.6					1536066	926075
					62	66
					65	65
					14.7994	.7999
7.	scratch					
14.8	15340	14359			16687	16266
21.8	74808	1223020			147908	815057
	87	28			89	60
	31	55			91	66
	14.7849	.7868			14.8097	.8110

measure
= 14.7859

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MC 466 1913 April 5. 53

Moon - Remeasures.

Reseau reversed.

	α		δ	
6				
14.9			14870	15401.
22.0			13301 00	69555 50
			10	40
			70	00
			14.8434	.8457

9 scratched				
15.8	19382	17898	14190	18840
22.8	11988 80	15310 14	55422 38	17488 80
	80	03	40	94
	85	98	92	46
	22.7401	.7411	15.1348	.1354

10				
15.4			18795	19228
23.0			17140 36	15855 90
			5242	83
			04	20
			15.3340	.3339

12				
0	17133	16408		
3.5	12165 60	11376 83		
	65	89		
	25	18		
	23.4966	.4970		

19	17102	15450		
23.6	10029 72	12509 10		
	20	16		
	98	50		
	23.7075	.7062		

3	16094	15460		
7.0	9035 39	12502 19		
23.6	40	17 13		
	99	60		
	23.7060	.7053		

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Moon-Rencontres.

Reseau reversed.

δ	α	ν	x d	ν
14.9			14870	15401
22.0			1330100	695550
			10	40
			70	00
			14.8434	.8452

9. Scratch

15.8	19382	17898	14190	18840
22.8	11988 80	15310 14	5542 38	1748880
	80	03	40	94
	85	98	92	46
	22.7401	.7411	15.1348	.1354

10.

15.4			18795	19228
23.0			12140 31	158855 90
			52	83
			04	20
			13.3340	.3339

11.

16.0	17133	16408
23.5	12165 60	11376 83
	65	89
	25	18
	23.4966	.4970

12.

16.9	17102	15450
23.6	10029 72	12509 10
max	20	16
in	98	50
y	237075	.7062

13.

13	16094	15460
17.0	9035 39	12502 19
23.6	40	17 13
	99	60
	23.7060	.7053

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MC 966 1913 April 5. 54

Moon's Center – Remeasures.

	x	x − X₀	(x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	16.0000	− 0.9010	0.8118	4.3882	− 124
2	15.5576	− 1.3439	1.8047	4.3810	− 196
3	15.1102	− 1.7908	3.2070	4.4022	+ 16
4	14.8938	− 2.0072	4.0288	4.3953	− 53
5	14.8502	− 2.0508	4.2058	4.4025	+ 19
6	14.7996	− 2.1014	4.4159	4.4153	+ 153
7	14.8004	− 2.0906	4.3706	4.4032	+ 26
8	14.8443	− 2.0567	4.2300	4.3857	− 149
9	15.1351	− 1.7659	3.1184	4.4071	+ 65
10	15.3340	− 1.5670	2.4555	4.4004	− 2
11	16.0000	− 0.9010	0.8118	4.3892	− 114
12	16.9010	0.0000	0.0000	4.4159	+ 153
13	17.0000	+ 0.0990	0.0098	4.4206	+ 200
				mean = 4.4006	− 6

	y	y − Y₀	(y − Y₀)²
1	19.7140	− 1.8914	3.5774
2	20.0000	− 1.6054	2.5773
3	20.5121	− 1.0933	1.1952
4	21.0000	− 0.6054	0.3665
5	21.1618	− 0.4436	0.1967
6	21.6054	0.0000	0.0000
7	21.7860	+ 0.1806	0.0326
8	22.0000	+ 0.3946	0.1557
9	22.7406	+ 1.1352	1.2887
10	23.0000	+ 1.3946	1.9449
11	23.4968	+ 1.8914	3.5774
12	23.7068	+ 2.1014	4.4159
13	23.7056	+ 2.1002	4.4108

Approximate Center.

x = 16.0 y = 19.7140
23.4968
43.2108
mean y = 21.6054
y-max = 23.7068
R = 2.1014
x + min = 14.7996
X₀ = 16.9010

Center { X₀ = 16.9010 / Y₀ = 21.6054

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MC 966 — 1913 April 5. — 54

Moon's Center — Remeasures.

	x	x − X₀	(x − X₀)²	(x − X₀)² + (y − Y₀)²	O − C
1	16.0000	− 0.9010	0.8118	4.3882	− 124
2	15.5576	− 1.3439	1.8047	4.3810	− 196
3	15.1102	− 1.7908	3.2070	4.4022	+ 16
4	14.8938	− 2.0072	4.0288	4.3953	− 53
5	14.8502	− 2.0508	4.2058	4.4025	+ 19
6	14.7996	− 2.1014	4.4159	4.4159	+ 153
7	14.8804	− 2.0906	4.3706	4.4032	+ 26
8	14.8443	− 2.0567	4.2300	4.3857	− 149
9	15.1351	− 1.7659	3.1184	4.4071	+ 65
10	15.3340	− 1.5670	2.4555	4.4004	− 2
11	16.0000	− 0.9010	0.8118	4.3892	− 114
12	16.9010	0.0000	0.0000	4.4159	+ 153
13	17.0000	+ 0.0990	0.0098	4.4206	+ 200
				mean = 4.4006	− 6

	y	y − Y₀	(y − Y₀)²
1	19.7140	− 1.8914	3.5774
2	20.0000	− 1.6054	2.5773
3	20.5121	− 1.0933	1.1952
4	21.0000	− 0.6054	0.3665
5	21.1618	− 0.4436	0.1967
6	21.6054	0.0000	0.0000
7	21.7860	+ 0.1806	0.0326
8	22.0000	+ 0.3946	0.1557
9	22.7406	+ 1.1352	1.2887
10	23.0000	+ 1.3946	1.9449
11	23.4968	+ 1.8914	3.5774
12	23.7068	+ 2.1014	4.4159
13	23.7056	+ 2.1002	4.4108

Approximate Center.

x = 16.0 y = 19.7140
23.4968
4.32108
mean y = 21.6054
y max = 23.7068
R = 2.1014
x min = 14.7996
X₀ = 16.9010

Center { X₀ = 16.9010 / Y₀ = 21.6054

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Formation of Doublets

No	at	an	bn
1	+ 1.70	+ 111.5	+ 234.2
2	+ 2.16	+ 262.5	+ 315.0
3	+ 1.95	− 28.6	− 17.5
4	+ 1.22	+ 106.5	+ 32.3
5	+ 0.90	− 34.0	− 8.4
6	− 0.00	− 321.0	+ 0.0
7	− 6.38	− 54.4	+ 4.7
8	− 0.80	+ 307.2	− 58.0
9	− 2.02	− 1150	+ 74.0
10	− 2.18	+ 3.1	− 2.8
11	− 1.70	+ 102.5	− 215.5
12	+ 0.00	+ 6.0	+ 321.5
13	+ 0.21	+ 20.0	+ 420.0
	+ 1.06	+ 354.8	+ 1099.5

[aa) = + 33.47
[ac) = − 18.48

[bb) = + 23.94
[bc) = + 3.55

arc = −6

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MC 966 1913 April 5. 55

Moon's Center - Reobserved

Conditional Equations

	a	b	c	O		b	O-C
1	-0.90	-1.89	+1	= -124	- 8 - 87	= -95	-29
2	-1.34	-1.61	+1	= -196	- 12 - 74	= -86	-110
3	-1.79	-1.09	+1	= +16	- 17 - 50	= -67	+83
4	-2.01	-0.61	+1	= -53	- 19 - 28	= -37	-16
5	-2.05	-0.49	+1	= +19	- 18 - 20	= -29	+48
6	-2.10	+0.00	+1	= +153	- 19 + 0	= -19	+172
7	-2.09	+0.18	+1	= +26	- 18 + 8	= -11	+37
8	-2.06	+0.39	+1	= -149	- 19 + 18	= -1	-148
9	-1.77	+1.14	+1	= +65	- 16 + 52	= +36	+29
10	-1.57	+1.39	+1	= -2	- 15 + 64	= +49	-51
11	-0.90	+1.89	+1	= +114	- 8 + 87	= +79	-193
12	+0.00	+2.10	+1	= +153	- 0 + 96	= +96	+57
13	+0.10	+2.10	+1	= +200	+ 1 + 96	= +97	+103

-547 +529

Average (O-C) = 83

P.E. = ±80

Normal Equations

$+35.47 + 1.06 - 18.48 = +355$

$+1.06 + 23.74 + 3.55 = +1100$

$-18.48 + 3.55 + 13.00 = -6$

$-1.06 - 0.03 + 0.58 = -11$

$+18.48 + 0.58 - 10.20 = +196$

$+23.71 + 4.13 = +1089$

$+4.13 + 2.80 = +190$

$-4.13 - 0.72 = -190$

$+2.08 = 0$

c = 0 ± 55

$-6.19 - 4.13 = -289$

$+17.61 = +809$

b = +46 ± 19

$+5.51 - 1.06 - 3.85 = +2$

$+123.50 - 23.74 - 87.00 = +40$

$+38.98 - 22.36 = +357$

$+124.86 - 83.45 = +1140$

$-33.35 + 22.36 = -305$

$+5.63 = +52$

a = +9 ± 34

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MC 966 — 1913 April 5.

Moon's Center - Rectascension.

Conditional Equations.

	a	b	c	O		b	O − C
1	−0.90	−1.89	+1	= −124	− 8	− 87 = − 95	−29
2	−1.34	−1.61	+1	= −196	− 12	− 74 = − 86	−110
3	−1.79	−1.09	+1	= +16	− 16	− 50 = − 67	+83
4	−2.01	−0.61	+1	= −53	− 18	− 28 = − 37	−16
5	−2.05	−0.44	+1	= +19	− 18	− 20 = − 29	+48
6	−2.10	+0.00	+1	= +153	− 19	+ 0 = − 19	+172
7	−2.09	+0.18	+1	= +26	− 19	+ 8 = − 11	+37
8	−2.06	+0.39	+1	= −149	− 19	+ 18 = − 1	−148
9	−1.77	+1.14	+1	= +65	− 16	+ 52 = + 36	+29
10	−1.57	+1.39	+1	= −2	− 14	+ 64 = + 49	−57
11	−0.90	+1.89	+1	= −114	− 8	+ 87 = + 79	−193
12	+0.00	+2.10	+1	= +153	+ 0	+ 96 = + 96	+57
13	+0.10	+2.10	+1	= +200	+ 1	+ 96 = + 97	+103

−547 + 529

Average (O − C) = 83

P. 2 = 50

Normal Equations

+33.47	+ 1.06	− 18.48	= + 355
+ 1.06	+ 23.74	+ 3.55	= + 1100
− 18.48	+ 3.55	+ 13.00	= − 6
− 1.06	− 0.03	+ 0.58	= − 11
+ 18.48	+ 0.58	− 10.29	= + 196
	+ 23.71	+ 4.13	= + 1089
	+ 4.13	+ 2.81	= + 190
	− 4.13	− 0.72	= − 190
		+ 2.09	= 0
	− 6.07	− 4.13	= − 279
	+ 17.64		= + 810

c = 0 ± 55

b = +46 ± 19

+ 5.51	− 1.06	− 3.88	= + 2
+123.75	− 23.74	− 87.00	= + 40
+ 38.98		− 22.36	= + 357
+124.81		− 83.45	= + 1140
− 33.20		+ 22.36	= − 306
+ 5.78			= + 51

a = +9 ± 34

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MC 966 1913 Apr. 7. 56

Moon's Position - Remeasured.

$X_0 = 16.9010$ $Y_0 = 21.6054$ $R^2 = 4.4006$

$\frac{1}{2}a = +5$ $\frac{1}{2}b = +23$ $c = 0$

16.9015 21.6077 $R = 2.0978$

Practically same as first measured. $\Delta R = -8$

$R = 978.3$

$S = 963.6$

$\Delta S = 16.0$ $S = 979.6$

$R - S = -1.3$

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NC 966 1913 Apr. 7. 56

Moon's Position - Remeasured.

X_0 =	14.9010	Y_0 = 21.6054	R^2 = 4.4006
$\frac{1}{2}a$ =	+ 5	$\frac{1}{2}b$ + 23	c = 0
	16.9015	21.6077	

R = 2.0998
ΔR = − 8
R = 978.3

Practically same as first measured.

S = 963.6
ang. : 16.0

S = 979.6

R − S = − 1.3

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1912 Nov. 20 57

MC 967

Comparison Stars
Standard Coordinates.

	1	2	3
α	$7^h\ 06^m\ 51^s.26$ ✓	$7^h\ 07^m\ 33^s.26$ ✓	$7^h\ 13^m\ 26^s.76$ ✓
A	7 12 00	7 12 00 ✓	7 12 00 ✓
α-A	− 5 08.74 ✓	− 4 26.74 ✓	+ 1 26.76 ✓
sin(α-A)	− 30871 ✓	− 266.72 ✓	+ 86.76
log "	2.489555 m	2.426055 m ✓	1.938321 ✓
" cosδ	9.995376 ✓	9.994620 ✓	9.995328 ✓
" ξ_0	0.950555 m	0.879449 m	0.399884
ξ_0	−8.9238	−7.5768	+2.5052
ξ_1	− 30	− 21	+ 3
3	269268	25.5789	15.4945
χ	26.6890	25.2944	15.2524
χ-3	+2578	+.2845	+2421

signs of χ + η changed.

δ	+25° 58′ 18.″0 ✓	+27° 55′ 56.″6 ✓	+26° 06′ 15.″4 ✓
D	+26 54 32	+26 54 32 ✓	+26 54 32 ✓
δ-D	− 56 14.0 ✓	+ 1 01 24.6 ✓	− 48 16.6 ✓
tan(δ-D)	− 33743	+ 3685.0 ✓	− 28968
log "	3.528195 ✓	3.566445 ✓	3.461925 ✓
" η_0	0.859345 ✓	0.897759	0.793075 ✓
tanδ	9.6876 ✓	9.7244 ✓	9.6902 ✓
ξ_2	19011 ✓	17590 ✓	07977 ✓
η_1	8.6421 ✓	8.5368 ✓	7.5413 ✓
η_0	−7.2333 ✓	+7.8993 ✓	−6.2097 ✓
η_1	+ 439 ✓	+ 344 ✓	+ 35 ✓
η	29.1894 ✓	14.0663 ✓	28.2062 ✓
4	29.2007 ✓	14.0837 ✓	28.2529 ✓
η-4	− 113 ✓	− 174	− 467 ✓

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1912 Nov. 20

MC 967

Comparison Stars

Standard Coordinates.

	1	2	3
α	$7^h\ 06^m\ 51^s.26$	$7^h\ 07^m\ 33^s.26$	$7^h\ 13^m\ 26^s.76$
A	7 12 00	7 12 00	7 12 00
X-A	− 5 08.74	− 4 26.74	+ 1 26.76
sin (X-A)	− 30871	− 266.72	+ 86.76
log "	2.489555 n	2.426055 n	1.938332
" cos δ	9.995376	9.946260	9.995328
" ξ_0	0.950555 n	0.879499 n	0.398844
$\bar{\eta}_0$	− 8.9238	− 7.5768	+ 2.5052
ξ_1	− 30	− 21	+ 3
$\bar{\eta}$	26.9268	25.5789	15.4945
X	26.6890	25.2944	15.2524
x-$\bar{\eta}$	+ 2378	+ 2845	+ 2421

Signs of x + y changed.

δ	+25° 58′ 18″.0	+27° 55′ 56″.6	+26° 06′ 15″.4
D	+26 54 32	+26 54 32	+26 54 32
δ+D	− 56 14.0	+ 1 01 24.6	− 48 16.6
tan(δ-D)	− 33743	+ 3685.0	− 2896.8
log "	3.528119 n	3.566444	3.461924 n
" η_0	0.859344 n	0.897459	0.793074 n
" tan δ	9.6876	9.7244	9.6902
" ξ_1^2	19011	17690	07977
" η_1	8.6421	8.5468	7.5413
η_0	− 7.2333	+ 7.8993	− 6.2097
η_1	+ 439	+ 352344	+ 35
η	29.1894	14.0655,0663	28.2062
y	29.2007	14.0837	28.2529
y-η	− 113	− ~~182~~ − 174	− 467

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Comparison stars - Standard coordinates.

	4	5	
α	$7^h\ 18^m\ 24^s.14$ ✓	$7^h\ 19^m\ 19^s.10$	
A	7 12 00 ✓	7 12 00	
α−A	+ 6 24.14 ✓	+ 7 19.10	
sin(α−A)	+ 384.09	+ 439.03	
log "	2.58443	2.64249 ✓	
" cos δ	9.94607 ✓	9.95065 ✓	
" ξ_0	1.03774	1.10038	Smit
ξ_0	+10.9078	+12.6003	
η_0	+ 50	+ 49	
η_0	7.0872	5.3948	
x	6.7980	5.1313	
x−ξ	+2892	+2635	

signs of x + q changed.

δ	27° 58′ 03.″1 ✓	+26° 48′ 03.″9
D	+26 54 32 ✓	+26 54 32
δ−D	+1 03 31.1 ✓	− 6 28.1
tan(δ−D)	+ 3811. ✓	− 388.1
log "	3.58110 ✓	2.58894n
" η_0	0.91225 ✓	9.92009n
" tan δ	9.72511 ✓	9.7034 ✓
" ξ_0	20755 ✓	22008
" η_1	8.8540	8.9576
η_0	+8.1705 ✓	−0.8319
η_1	+ 715 ✓	+ 907
η	13.7580	22.7412
y	13.8269 ✓	22.8150
y−η	− 689 ✓	− 738

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INC967

Comparison stars. Standard Coordinates.

	4	5
α	$7^h\ 18^m\ 24^s.14$	$7^h\ 19^m\ 19^s.10$
A	7 12 00	7 12 00
α-A	+ 6 24.14	+ 7 19.10
sin(α-A)	+ 384.09	+ 439.03
log..	2.584443	2.642491
.. cosδ	9.946075	9.950655
.. S_0	1.037774	1.100387
S_0	+10.90778	+12.60037
s_0	+ 50	+ 49
S	7.0872	5.3948
x	6.7980	5.1313
x-S	+2892	+2635

signs of x + y changed.

δ	27° 58′ 03.″1	+26° 48′ 03.″9
D	+26 54 32	+26 54 32
δ-D	+1 03 31.1	− 6 28.1
tan(δ-D)	+ 3811.5	− 388.1
log..	3.581107	2.588944
.. η_0	0.912255	9.920094
.. tanδ	9.72515	9.70348
.. S_0	20755	22008
.. η_0	8.8540	8.9576
η_0	+8.17055	−0.8319
η_0	+ 715	+ 907
η	13.7580	22.7412
y	13.8269	22.8150
y-η	− 689	− 738

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MC 967 1912 Oct 29.

Comparison Stars - Measures.

y	d	N	d'	N
26.7	15221	15965	15752	15779
29.2	13200 11	79506 0	12645 39	88787 6
	05	56	45	39
	06	51	32	61
	29.2013	.2001	26.6897	.6888
2/				
25.3	16195	16559	15050	15499
14.1	15360 51	74201 6	79818 1	12551 58
	55	14	82	50
	80	84	45	15
	14.0839	.0835	25.2935	.2951
3/				
15.2	16739	16518	14530	16545
28.3	14200 08	90403 4	70505 4	14018 10
	00	39	58	20
	29	11	34	42
	28.2533	.2525	15.2521	.2528
4/				
6.8	14250	14378	14239	15000
13.8	59616 6	12644 4	12209 6	70255 30
	64	59	03	30
	37	88	27	16
	13.8276	.8262	6.7969	.7985
5/				
5.1	16328	15546	15311	14751
22.8	81655 5	13690 9 2	66124	13440 36
	63	92	10	40
	14	51	00	71
	22.8155	.8144	5.1311	.1315

Remeasures

1) x(d)	15124	2.x.(d)	14511	4 x (d)	13850
	12010 12		74455 49		11830 28
	09		51		31
	20		10		55
	26.6889		25.2938		6.7979

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1912 Oct 29.

MC 967

Comparison Stars - Measures.

	4			2	
	d	N	d	N	
1/					
26.7	15221	15965	15752	15779	
29.2	13200 11	79596 0	12645	88787	6
	05	56	45	79	
	06	51	32	61	
	29.2013	.2001	26.6897	.6888	
2/					
25.3	16195	16559	15050	15499	
14.1	15360 51	74201 6	79818	12551	58
	55	14	82	50	
	80	84	45	15	
	14.0839	.0835	25.2935	.2951	
3/					
15.2	16739	16518	14530	16545	
28.3	14200 08	90403 4	70505	14018	10
	00	39	58	20	
	29	11	34	42	
	28.2533	.2525	15.2521	.2528	
4/					
6.8	14250	14378	14239	15000	
13.8	5961 66	12644 4	12209	70225	30
	64	39	03	30	
	37	88	27	16	
	13.8276	.8262	6.7969	.7985	
5/					
5.1	16328	15546	15311	14751	
22.8	8165 59	13690 9	6612 1	13440	36
	63	92	10	40	
	14	51	00	71	
	22.8155	8144	5.1311	.1315	
Remeasures					
1)	x(d) 15124	2.x(d) 14511		4 x (d) 13850	
	12010 12	7445 4	9	11836	28
	09	51		31	
	20	10		55	
	26.6889	25.2938		6.7979	

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MC967 1912 Oct 29}
Oct 30}

Points on moon's limb
measures.

4

	d		r	
1/				
19.0	14569		16256	
20.8	686281		1395250	
	7072		5650	possibly on terminator
	75		54	
	20.77703		.7697	
2/				
19.2	13563		15270	
20.8	595459		1286858	
	5860		5154	
min	65		66	
in 4.				
	20.7607		.7589	
3/				
20.0	15535		16177	
20.9	6294496		15428 27	
	9498		3030	
	43		76	
	20.9246		.9252	
4/				
21.0	14160		16288	
21.8	626145		14194 94	
	6057		9498	
	65		92	
	21.7908		.7907	
5/				
21.0	16209		15329	
23.9	6932 36		1455842	
	3235		4742	
	09		37	
	23.9275		.9217	
6/				
20.0	16387		14047	
24.7	838978		12000 09	
	1074		0509	
	76		51	
	24.7990		.7958	

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MC967 1912 Oct 29 (Oct 30)

Points on moon's limb measures.

4

1/	d	n
4.0	14569	16256
20.8	686281	1395250
	7072	5650
	75	54
	20.7703	.7697
2/		
4.2	13563	15270
0.8	595459	1286858
	5860	5154
	65	66
	20.7607	.7589
3/		
20.0	15535	16177
20.9	629496	1542827
	9498	3030
	43	76
	20.9246	.9252
4/		
21.0	14160	16288
21.8	626145	1419494
	6057	9498
	65	92
	21.7908	.7907
5/		
21.0	16209	15329
23.9	693236	1455842
	3235	4742
	09	37
	23.9275	.9217
6/		
20.0	16387	14047
24.7	838978	12000009
	1079	0504
	76	51
	24.7990	.7958

possibly on terminator

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MC 967 1912 Oct. 29.

Points on moon's limb. measures.

		α		N
7				
20.2		15332		15082
21.0		697444		1348438
		6162		3850
		32		72
		20.1628		.1640
8				
21.1		15082		16197
22.0		615265		1506379
		6855		7584
		71		10
		21.1090		.1123
9				
21.7		15318		15229
22.8	ragged	826166		1228.077
maxim	edge.	6964		7470
α.		22		40
		21.2944		.2957
10				
21.3		15300		14251
23.0		819199		1134555
		9597		4959
		05		59
		21.2892		.2901
11				
20.9		14137		
24.0		13660422		902239
		6050		3028
				8567
		20.9516		.9537

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MC 967 1912 Oct. 29.

Points on moon's limb. Measures.

		d	N
7			
20.2		15352	15092
21.0		697449	1348438
		6162	3850
		32	72
		2D1628	.1640
8			
21.1		15082	16197
22.0		615265	1506379
		6855	7584
		71	10
		211090	.1123
9			
21.7		15318	15229
22.8	ragged	826166	1228077
maxim	edge.	6964	7470
x.		22	40
		21.2944	.2957
10			
21.3		15300	14251
23.0		819199	1134155
		9597	4959
		05	59
		212892	.2401
11			
20.9		14137	
24.0		1366042	9022390
		6050	3028
			8567
		209516	.9537

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MC967

Mean measured coordinates of comp. stars and coords of plate center.

Star	x	y
1	26.6890	29.2007
2	25.2944	14.0837
3	15.2524	28.2529
4	6.7980	13.8269
5	5.1313	22.8150
5	79.17 ✓	108.18 ✓
	15.83	21.64
	−18	−22.
	−2.17	−.36
	31	465
	217	2790
	651	1395
	67.27	167.40

Mean R.A. from p. 43.

$7^h\ 13^m\ 07^s$

$-\quad 1\ 07$

$7\ 12\ 00$

Mean Decl.

$+26^\circ\ 57'\ 19''$

$-\quad 2\ 47$

$+26\ 54\ 32$

$7^h\ 12^m\ 00^s$ } center of plate.
$+26^\circ\ 54'\ 32''$ }

Preliminary Reductions.

x − x̄	+ 334		− 3345
+2378	+973	= +3351	= +6
+2845	+469	= +3314	= −31
+2421	+942	= +3363	= +18
+2892	+461	= +3353	= +8
Mean +19.195 ✓	+754 ✓		= −19.4543 ✓

y − ȳ	− 30x		+ 916
−113	−1801 ✓	= −914 ✓	= +2
−174	−759 ✓	= −933 ✓	= −17
−467	−458 ✓	= −925 ✓	= −9
−689	−204 ✓	= −893 ✓	= +23
−22.8591 ✓	−576 ✓		= −22.8251 ✓

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1911phae.proj 188

1912 Nov. 5.

MC967

Mean measured coordinates of comp. stars and coords of plate center.

Star	x	y.
1	26.6890	29.2007
2	25.2944	14.0837
3	15.2524	28.2529
4	6.7950	13.8269
5	5.1313	22.8150
5	79.17	108.12
	15.83	21.64
	18	22.
	2.17	.36
	31	465
	2.17	2790
	651	1395
	67.27	167.40

Mean R.A. from p. 43.

$7^h\ 13^m\ 07^s$

$-\quad 1\ 07$

$7\ 12\ 00$

Mean Decl.

$+26^\circ\ 57'\ 19''$

$-\quad 2\ 47$

$+26\ 54\ 32$

$7^h\ 12^m\ 00^s$ } center of plate.
$+26^\circ\ 54'\ 32''$ }

Preliminary Reductions.

$x - x_5$	$+334$		-3345
$+2378$	$+973$	$= +3351$	$= +6$
$+2845$	$+469$	$= +3314$	$= -31$
$+2421$	$+942$	$= +3363$	$= +18$
$+2492$	$+461$	$= +3353$	$= +8$
mean 19.195	$\bar{z}$	$+754$	$= -19.4543$

$y - y_5$	$-30x$		$+916$
-113	-1801	$= -914$	$= +2$
-182	-759	$= -941$	$= -25$
-467	-448	$= -915$	$= +1$
-689	-204	$= -893$	$= +23$
-22.8591	-576		-22.8251

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MC 967.

Comp. Stars

Plate constants

Conditional equations

a	b	+ k	x − 3	y − 7
+26.69	+29.20	+ 1	= + 6.	+ 2
+25.29	+14.01	+ 1	= − 31	− 17
+15.25	+28.25	+ 1	= + 18	− 9
+ 6.80	+13.83	+ 1	= + 8	+ 2.5

Mean Equations

+25.99	+21.60	+ 1	= − 12.50	− 7.50
+11.02	+21.04	+ 1	= + 13.00	+ 7.00
+20.97	+28.72	+ 1	= + 12.00	− 3.50
+16.04	+13.92	+ 1	= − 11.50	+ 3.00

+14.97	+ 0.56		= − 25.50	− 14.50
+ 4.93	+14.80		= + 23.50	− 6.50
− 4.93	− 0.18		= + 8.40	+ 4.78
	+14.62		= + 31.90	− 1.72
		b	= + 2.18	− 0.12

+14.97a = −25.50 − 4.22 = −26.72 −14.50 + 0.07 = −14.43

a = − 1.79 − 0.97

−12.5	+13.0	+12.0	−11.5	−7.5	+7.0	−3.5	+3.0
+ 46.4	+ 19.6	+ 37.4	+ 28.6	+20.1	+10.6	+20.2	+15.5
− 47.0	− 45.8	− 62.6	− 30.3	+ 2.5	+ 2.5	+ 3.4	+ 1.6
= 13.1	− 13.2	− 13.2	− 13.2	+20.1	+20.1	+26.1	+20.1

Residuals in x

			c	o	o − c
−48	+64	−13	= + 3	+ 6	+ 3
−45	+30	−13	= − 28	− 31	− 3
−27	+61	−13	= + 21	+ 18	− 3
−12	+30	−13	= + 5	+ 8	+ 3

Residuals in y

			c	o	
−26	− 3	+20	= − 9	+ 2	= + 11
−24	− 2	+20	= − 6	− 17	= − 11
−15	− 3	+20	= + 2	− 9	= − 11
− 7	− 2	+20	= +11	+23	= + 12

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MC 967.

Comp. Stars

Plate constants

Conditional equations.

a	b	+ L	x − ξ	+ η
+26.69	+29.20	+ 1 =	+ 6.	+ 2
+25.29	+14.01	+ 1 =	− 31	− 25
+15.25	+28.25	+ 1 =	+ 18	+ 1
+ 6.80	+13.83	+ 1 =	+ 8	+ 23

Mean Equations

+25.99	+21.60	+ 1 =	− 12.50	− 11.50
+11.02	+21.04	+ 1 =	+ 13.00	+ 12.00
+20.97	+28.72	+ 1 =	+ 12.00	+ 1.50
+16.04	+13.92	+ 1 =	− 11.50	− 1.00
+14.97	+ 0.56	=	− 25.50	− 23.50
+ 4.93	+14.80	=	+ 13.50	+ 2.50
− 4.93	− 0.18	=	+ 8.40	+ 7.74
	+14.62	=	+ 31.90	+ 10.24
		b =	+ ~~1.03~~ +2.18	+ ~~0.36~~ −0.12

+14.97a = −25.50 − 0.57 = −26.07 | −23.50 + 0.20 = −23.30

a = − 1.79 | − ~~1.55~~ − 0.97

−12.5	+13.0	+12.0	−11.5	−11.5	+12.0	+1.5	−1.0	
+ 45.3	+ 19.4	+ 36.5	+ 28.0	+40.5	+17.1	+32.6	+25.0	
− 21.9	− 21.3	− 29.1	− 14.1	+ 7.8	+ 7.6	+ 10.3	+ 5.0	
+ ~~10.4~~	+ ~~11.1~~			~~+3.8~~	+36.7	44.4		
−13.2				+20.1				

Residuals in x

		O − C
+ 46	+ 30	+ 3
− 44	+ 14	− 3
− 26	+ 29	− 3
− 14	+ 14	+ 3

Residuals in η

− 42	− 11	+ 11
− 39	− 5	− 11
− 24	− 10	− 11
− 11	− 5	+ 12

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Times etc.

Exp. to stars 1912, Mar 9.	$8^h\ 02^m$	to	$8^h\ 14^m$
" " moon	8 08 13.2		8 08 13.4
Clock fast	2 36.8		
H. Sid. T	$8^h\ 05^m\ 36.5^s$		
H Long	4 44 31.05		
G. Sid T	12 50 07.55		
Sid T mean noon	23 04 13.82		
Interval	13 45 53.73		
Reduction	− 2 15.30		
G.M.T	13 43 38.43		

From Am. Eph.

	R.A.		Decl	
Moon 14^h	$7^h\ 12^m\ 38.^s10$		$+27°\ 03'\ 34.''1$	
motion in 1^m = 2.6078			3.001	
" " $-16^m.3595$	−	42.66	+	49.1
Tabular place	7 11	55.44	+27° 04	23.2
Moon's parallax		58'	50.6	
Semidiam		16	03.6	

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MC 967 1912 Nov. 22. 64

Times etc.

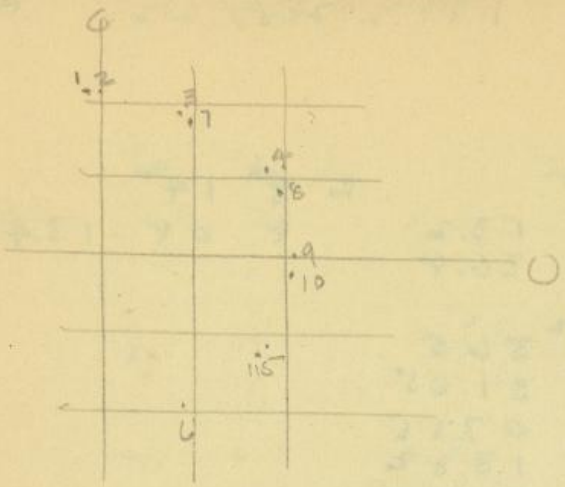
Exp. stars 1912, Nov 9.	8^h	02^m		to 8^h	14^m	
" moon	8	08	13.2	8	08	13.4
Clock fast		2	36.8			
M. Sid. T	8^h	05^m	36.5			
M. Sid. T	4	44	31.05			
G. Sid. T	12	50	07.55			
Sid. T mean noon	23	04	13.82			
Interval	13	45	53.73			
Reduction		2	15.30			
G. M. T	13	43	38.43			

From Eph.		R. A.			Decl	
Moon 14h	7^h	12^m	38.10	+ 27°	03'	34.1
Motion in 1m			3.001			
" " +16m.3595			42.66			49.1
Tabular place	7	11	55.44	27°	04'	24.6

Moons parallax 58' 50.6"
" semidiam. 16' 03.6

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Rl.	Pos. ∠	Resid.
6	202°.5	+49
11	237.2	−98
5	239.5	−74
10	266.2	+64
9	270.0	+93
8	294.2	+69
4	300.6	−15
7	332.5	−64
3	337.5	−111
2	0.0	+73
1	5.3	+25

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Moon's center.

	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	19.0000	+0.1936	0.0374	4.4105	+ 43
2	19.1936	0.0000	0.0000	4.4159	+ 97
3	20.0000	−0.8064	0.6502	4.3995	− 67
4	21.0000	−1.8064	3.2630	4.4087	+ 25
5	21.0000	−1.8064	3.2630	4.3938	− 124
6	20.0000	−0.8064	0.6502	4.3991	− 71
7	20.1634	−0.9698	0.9405	4.4045	− 17
8	21.1106	−1.9170	3.6749	4.4165	+ 103
9	21.2950	−2.1014	4.4159	4.4159	+ 97
10	21.2896	−2.0960	4.3932	4.4124	+ 62
11	20.9526	−1.7590	3.0941	4.3909	− 153
				4.4062	− 5

Signs of $(x-X_0)+(y-Y_0)$ are changed on account of reversal

	y	$y - Y_0$	$(y-Y_0)^2$
1	20.7700	+2.0912	4.3731
2	20.7598	+2.1014	4.4159
3	20.9249	+1.9363	3.7493
4	21.7908	+1.0704	1.1457
5	23.9246	−1.0634	1.1308
6	24.7974	−1.9362	3.7489
7	21.0000	+1.8612	3.4640
8	22.0000	+0.8612	0.7416
9	22.8612	0.0000	0.0000
10	23.0000	−0.1388	0.0192
11	24.0000	−1.1388	1.2968

Approximate Centers.

$x = 20.0$ $y = 20.9249$ $x = 21.0$ $y = 21.7908$

$x = 20.0$ $y = 24.7974$ $x = 21.0$ $y = 23.9246$

45.7223 45.7154

Mean $Y = 22.8612$: mean $Y = 22.8577$

y-min $= 20.7598$

$R = 2.1014$

x-max $= 21.2950$

$X_0 = 19.1936$ Assume as Center $\begin{cases} X_0 = 19.1936 \\ Y_0 = 22.8612 \end{cases}$

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Provisional

	x	$x - X_0$	$(x-X_0)^2$	$(x-X_0)^2+(y-Y_0)^2$	O − C
1	19.0000	+0.1936	0.0374	4.4105	+ .93
2	19.1936	0.0000	0.0000	4.4159	+ 1.47
3	20.0000	−0.8064	0.6502	4.3995	− .67
4	21.0000	−1.8064	3.2639	4.4087	+ .15
5	21.0000	−1.8064	3.2632	4.3938	− 1.24
6	20.0000	−0.8064	0.6502	4.3991	− .71
7	20.1634	−0.9698	0.9405	4.4045	− .17
8	21.1106	−1.9170	3.6749	4.4165	+ .93
9	21.2950	−2.1014	4.4159	4.4159	+ .97
10	21.2896	−2.0960	4.3932	4.4124	+ .62
11	20.9526	−1.7590	3.0941	4.3909	− 1.53

Signs of $(x-X_0)+(y-Y_0)$ are changed on account of reversal.

	y	$y - Y_0$	$(y-Y_0)^2$
1	20.7700	+2.0912	4.3731
2	20.7598	+2.1014	4.4159
3	20.9249	+1.9363	3.7493
4	21.7908	+1.0704	1.1457
5	23.9246	−1.0634	1.1308
6	24.7974	−1.9362	3.7489
7	21.0000	+1.8612	3.4640
8	22.0000	+0.8612	0.7416
9	22.8612	0.0000	0.0000
10	23.0000	−0.1388	0.0192
11	24.0000	−1.1388	1.2968

Approximate Centre.

$x = 20.0$ $y = 20.9249$
$x = 20.0$ $y = 24.7974$
45.7223

mean $Y = 22.8612$: mean y = 22.8577

$y = \min = 20.7598$
$R = 2.1014$
$x = \max = 21.2950$
$X_0 = 19.1936$

$x = 21.0$ $y = 21.7908$
$x = 21.0$ $y = 23.9246$
45.7154

Assume as centre $\begin{cases} X_0 = 19.1936 \\ Y_0 = 22.8612 \end{cases}$

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formation of Normals. with Slide rule 1

No		ab	aa	bb
1	+	0,40	+ 8,2	+ 90,0
2		0,00	0,0 +	203,8
3	−	1,57	+ 54,3 −	130,2
4	−	1,94	− 45,2 +	26,8
5	+	1,92	+ 224,2 +	131,5
6	+	1,57	+ 57,5 +	137,4
7	−	1,81	+ 16,5 −	31,6
8	−	1,65	− 197,9 +	88,7
9		0,00	− 203,8	0,0
10	+	0,29	− 130,2 −	8,7
11	+	2,01	+ 269,5 +	174,4
	−	0,78	+ 53,4 +	682,6

[aa] = +24,38 [bb] = +24,09

[ac] = −13,90 [bc] = +5,64 [cc] = −5,

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1 Uranus Centers.

Conditional Equations.

	a	b	c	O	c	O − C
1	+0.19	+2.09	+1 =	+43	− 6 + 88 − 64 =	+18	+25
2	0.00	+2.10	+1 =	+97	+ 88 − 64 =	+24	+73
3	−0.81	+1.94	+1 =	−67	+ 26 + 82 − 64 =	+44	−111
4	−1.81	+1.07	+1 =	+25	+ 59 + 45 − 64 =	+40	−15
5	−1.81	−1.06	+1 =	−124	+ 59 − 45 − 64 =	−50	−74
6	−0.81	−1.94	+1 =	−71	+ 26 − 82 − 64 =	−120	+49
7	−0.97	+1.86	+1 =	−17	+ 32 + 79 − 64 =	+47	−64
8	−1.92	+0.86	+1 =	+103	+ 62 + 36 − 64 =	+34	+69
9	−2.10	0.00	+1 =	+97	+ 68 − 64 =	+4	+93
10	−2.10	−0.14	+1 =	+62	+ 68 − 6 − 64 =	−2	+64
11	−1.76	−1.14	+1 =	−153	+ 57 − 48 − 64 =	−55	−98

+373 −362

Average (O − C) = 67

Normal Equations.

a	b	c	
+24.38	− 0.78	− 13.90	= + 53
− 0.78	+ 24.09	+ 5.64	= + 683
− 13.90	+ 5.64	+ 11.00	= − 5
+ 0.78	− 0.02	− 0.45	= + 2
+ 13.90	− 0.45	− 7.95	= + 30
	+ 24.07	+ 5.19	= + 685
	+ 5.19	+ 3.05	= + 25
	− 5.19	− 1.12	= − 148
		+ 1.93	= − 123
	− 8.84	− 5.19	= − 42
	+ 15.23		= + 643

$\frac{\Delta b}{\Delta a} = 2.10 \cdot -.21 = -0.45$

c = − 64

b = + 42

− 17.59	+ 7.14	+ 13.90	= − 6
+ 7.14	− 2.89	− 5.64	= + 3
+ 6.79	+ 6.36		= + 47
+ 6.36	+ 21.20		= + 686
− 1.91	− 6.36		= − 206
+ 4.88			= − 159

a = − 33

+ 752a − 424c = —

$\frac{\Delta \alpha}{\Delta \alpha} = 2.10 \cdot +.56 = +1.16$

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	a	b	c	O		C	O − C
1	+2.19	+2.09	+1	+43	=	−6+88−64 = +18	+25
2	0.00	+2.10	+1	+97		+88−64 = +24	+73
3	−0.81	+1.94	+1	−67		+264+82−64 = +444	−111
4	−1.81	+1.07	+1	+25		+59+45−64 = +40	−15
5	−1.81	−1.06	+1	−124		+59−45−64 = −50	−74
6	−0.81	−1.94	+1	−71		+26−82=64 = −120	+49
7	−0.97	+1.86	+1	−17		+32+79−64 = +47	−64
8	−1.92	+0.86	+1	+103		+64+36−64 = +34	+69
9	−2.10	0.00	+1	+97		+68 0 −64 = +4	+93
10	−2.10	−0.14	+1	+62		+68−6−64 = −2	+64
11	−1.76	−1.14	+1	−153		+57+48−64 = −55	−198

+379 − 30a

Average (O − C) = 67

Normal Equations

a	b	c		
+24.38	− 0.78	− 13.90	= + 53	
− 0.78	+ 24.09	+ 5.64	= + 683	
− 13.90	+ 5.64	+ 11.00	= − 5	
+ 0.78	− 0.02	− 0.45	= + 2	
+ 13.90	− 0.45	− 7.95	= + 30	
	+ 24.07	+ 5.19	= + 685	$\frac{\Delta b}{\Delta a}$ = 2.10 = 21 = 0.45
	+ 5.19	+ 3.05	= + 26	
	− 5.19	− 1.12	= − 148	
		+ 1.93	= − 123	c = − 64
	− 8.84	− 5.19	= − 42	
	+ 15.23		+ 643	b = + 42
− 17.59	+ 7.14	+ 13.90	= − 6	
+ 7.14	− 2.89	− 5.64	= + 3	
+ 6.79	+ 6.36		= + 97	
+ 6.36	+ 21.20		= + 686	
− 1.91	− 6.36		= − 206	
+ 4.88			= − 159	a = − 33

+ 752a − 424c = −1

$\frac{\Delta b}{\Delta a}$ = 2.10 + 1.50 = + 1.15

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Moon's mean position (1911.0)

$X_0 = -19.1936$ $Y_0 = -22.8612$

$\frac{1}{2}a = -16$ $\frac{1}{2}b = +21$

$X = -19.1952$ $Y = -22.8591$

From Berlin Reduction $X = -19.4543$ $Y_0 = -22.8251$

∴ Related constants ax : -35 -19

by : $+50$ -3

c : -13 $+20$

$X = -19.4541$ -22.8253

$\xi = -1.4541$ $\eta = -0.8253$

$\log \xi = 0.16259_n$ $\log \tan \delta = 9.7053$

∴ $\log \xi^2 = 9.95064$ ∴ $\xi^2 = 0.8951$

∴ const $= 8.50774$ ∴ const $= 7.0534$

∴ $(\alpha - A) = 1.70471_n$ ∴ $\eta_1 = 7.0938$

$\eta_1 = +12$

$\alpha - A = -50^s.66$ $\eta_0 = -0.8265$

$A = 7\ 12\ 00.$

$\log \eta_0 = 9.91724_n$

$\alpha_0 = 7^h\ 11^m\ 09^s.34$ ∴ const $= 7.33115$

$\text{Red} = +0.67$ ∴ $(\delta - D) = 2.58609_n$

$\alpha' = 7\ 11\ 10.01$ $\delta - D = -385.6$

$-6'\ 25''.6$

$D = +26\ 54\ 32.$

$\delta_0 = +26\ 48\ 06.4$

$\text{Red} = +7.2$

$\delta' = +26\ 48\ 13.6$

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MC 967 1911 Dec. 18. 67.

Gnomonic linear projection (1911.0)

X_0 =	−19.1936	Y_0 =	−22.8612
$\frac{1}{2}a$	− 16	$\frac{1}{2}b$ =	+ 21
X =	−19.1952	Y =	−22.8591

From Graduation Reduction X = −19.4543 Y_0 = −22.8251
∴ plate constants are: ax = − 35 − 19
by = + 50 − 3
c = − 13 + 20
X = −19.4541 −22.8253

ξ = −1.4541
log ξ = 0.16259n
∴ cos δ = 9.95064
cos i = 8.50774

∴ (α − A) = 1.70471n

α − A = − 50.66

A = 7 12 00.

α_0 = 7h 11m 09.34

Red = + 0.67

α′ = 7 11 10.01

η = −0.8253

log tan δ = 9.70553
∴ δ^2 = 0.3251
cos δ = 7.05274
η_1 = 7.0838
η_1 = + 12

η_0 = −0.8265

log η_0 = 9.91724n
cos δ = 7.33115

∴ (δ − D) = 2.58609n

δ − D = − 385.6
− 6′ 25.6

D = +26 54 32.

δ_0 = +26 48 06.4

Red = + 7.2

δ′ = +26 48 13.6

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Lunar parallax

α' = 7h 11m 10.01s ✓
Θ = 8 05 36.5 ✓
$\Theta - \alpha'$ = + 54m 26.5s ✓
= + 13° 36′ 30″ ✓

$\frac{1}{2}(\alpha - \alpha')$ = + 5 45 ✓

$(\Theta \alpha') - \frac{1}{2}(\alpha - \delta')$ = 13 30 45 ✓

log tan ϕ' = 9.95727 ✓
∴ cos $\frac{1}{2}(\alpha - \delta')$ 0.000000 ✓
∴ ∴ $(\Theta - \alpha' - \frac{1}{2}(\alpha - \delta')$ 9.98781 ✓
− ∴ tan γ = 9.96946 ✓

α + 42 59 14.0 ✓
δ' + 26 48 13.6
$\alpha - \delta'$ + 16 11 00.4 ✓

log $\rho \sin \phi'$ = 9.82640 ✓
∴ sin π = 8.23340 ✓
∴ sin $(\gamma - \delta')$ = 9.44516 ✓
− ∴ γ = 9.83368 ✓

∴ sin $(\delta - \delta')$ = 7.27128 ✓

$\delta - \delta'$ = + 16 07.6 ✓

δ = +27 04 21.2 α = 7 11 56.02 ✓
Am Eph δ = +27 04 23.2 ✓ α = 7h 11m 55.44s ✓
O − C = − 2.0 ✓ + 0.58 ✓
Corr to tan radius − 0.2 + 0.04
Final (O − C) − 22 + 0.62

δ' = +26 48 13.6 ✓
π 58′ 50″.6 ✓

log $\rho \cos \phi'$ = 9.86913 ✓
$\rho \sin \pi$ = 8.23340 ✓
∴ sin $(\Theta - \alpha')$ = 9.37159 ✓
− ∴ cos δ' = 9.94960 ✓

∴ sin $(\alpha - \alpha')$ = 7.52452 ✓

app. $(\alpha - \alpha')$ = + 11′ 30″

log cos δ = 9.94960
∴ ~~sin $(\alpha - \alpha')$~~ = + 11 30.2 ✓

~~$\alpha - \alpha'$ =~~

= + 46.0s ✓

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Lunar parallax

α' = 7h 11m 10.01s

$\odot$ = 8 05 36.5

$\odot - \alpha'$ = + 54 26.

= + 13° 36' 30"

$\frac{1}{2}(\alpha - \alpha')$ = + 5 45 ✓

$\odot - \frac{1}{2}(\alpha + \alpha')$ = 13 30 45 ✓

log tan ϕ' = 9.95727

∴ cos $\frac{1}{2}(\alpha - \delta)$ 0.00000 ✓

∴ $(\odot - \frac{1}{2}(\alpha + \alpha'))$ 9.98781 ✓

∴ tan γ = 9.96946 ✓

γ + 42 59 14.0 ✓

δ' + 26 48 13.6

$\alpha - \delta'$ = 16 11 00.4 ✓

log sin ϕ' = 9.82640

∴ sin π = 8.23340

∴ sin $(\psi - \delta')$ = 9.44516 ✓

∴ ψ = 9.83368 ✓

∴ sin $(\delta - \delta')$ = 7.67128

$\delta - \delta'$ = + 16 07.6

δ = + 27 04 21.2

Ann Eph δ = + 27 04 23.8

O − C − 20

Corr to Barnard − 0.2

Final (O − C) − 22

δ' = + 26 48 13.6

π 58 50.6

log p cos ϕ' = 9.86913

∴ sin π = 8.23340

∴ sin $(\odot - \delta')$ = 9.37159

∴ cos δ' = 9.94960

∴ sin $(\alpha - \alpha')$ = 7.52452 ✓

Appr $(\alpha - \alpha')$ = + 11' 30"

log cos δ = 9.94960

∴ $(\alpha - \alpha')$ = + 11 30.2

$\alpha - \alpha'$ =

= + 46.01

α = 7h 11m 56.02

α = 7h 11m 55.44

+ 0.58

+ 0.04

+ 0.62

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