

KG

11366

11056



Hayn's Corrective



for plates of

Oct 7, 1911

(6-b)

Plate 1301 Computation of Earth Selenographic Coordinates
1911 Oct 7, 12^h 57^m

$$\lambda = 11^{\circ} 54.9'$$

$$\beta = -1^{\circ} 42.8'$$

$$\sigma = 16 \quad 32.6$$

$$\delta = 31 \quad 36.5$$

$$\delta - \lambda = 19 \quad 41.0 \quad \log \sin = 9.52740 \quad \log \cos = 9.97385$$

$$I = 1 \quad 28.8 \quad \log \tan I = 8.41224 \quad \log \tan J = 8.41209$$

$$1 \quad \log \tan B = 7.93964 \quad \log A = 8.38594$$

$$B = +0^{\circ} 29.9'$$

$$A = +0.0243$$

$$\beta = -1 \quad 42.8$$

$$b = +2.2'$$

$$(b) \text{ or libration in lat} = B - \beta = +2 \quad 12.7$$

$$AB = +0.053 = +3.2'$$

$$= \underline{\underline{+2.21}}$$

$$\lambda' = \lambda + AB = 11^{\circ} 58.1'$$

$$\sigma = 16 \quad 32.6$$

$$(b) \text{ or libration in long} = \lambda - \sigma = -4^{\circ} 34.5'$$

$$= \underline{\underline{-4.57}}$$

$$l = 22^{\circ} 12.3'$$

$$\log \sin i = 9.57740$$

$$\log \cos(\alpha - \delta') = 9.98751$$

$$\log \cos b = 9.99967$$

$$\log \sin C = 9.56524$$

$$C = -21^{\circ} 33.6'$$

$$= \underline{\underline{-21.56}}$$

$$\alpha = 0^{\circ} 46' 30.66''$$

$$= 11^{\circ} 37.5'$$

$$\delta' = 357 \quad 56.7$$

$$\alpha - \delta' = 13^{\circ} 40.8'$$

1315 - 1911 Oct 7 A.M.T. 19^h 19.6

$$\begin{aligned}\lambda &= 15^{\circ} 34.5' \\ \beta &= -1 \quad 23.6 \\ \delta &= 20 \quad 02.1 \\ \delta_b &= 31 \quad 40.8\end{aligned}$$

$$\begin{aligned}\delta_b - \lambda &= 16 \quad 06.3 & \log \sin &= 9.44310 & \log \cos &= 9.98261 \\ I &= 1 \quad 28.8 & \log \tan I &= 8.41224 & \log \sin I &= 8.41209 \\ & & \log \tan B &= 7.85534 & \log H &= 8.39470\end{aligned}$$

$$\begin{aligned}B &= 0^{\circ} 24.6 & A &= +0.0248 \\ \beta &= -1 \quad 23.6 & b &= +1.8 \\ B - \beta &= 1 \quad 48.2 & Ab &= +0.0446 = +2.7 \\ & & & +1.80\end{aligned}$$

libration in lat =

$$\begin{aligned}\lambda' &= \lambda + Ab = 15^{\circ} 37.2' \\ \delta &= 20 \quad 02.1 \\ \lambda' - \delta &= -4 \quad 24.9\end{aligned}$$

libration in long. -4^{\circ} 42

$$\begin{aligned}i &= 22^{\circ} 12.3' \\ \log \sin i &= 9.57740 \\ \log \cos(\alpha - \delta_b') &= 9.98075 \\ \log b &= 9.99979\end{aligned}$$

$$\log \sin C = 9.59686$$

$$C = -23^{\circ} 16.9'$$

$$C = \underline{\underline{-23^{\circ} 28'}}$$

$$\begin{aligned}\alpha &= 0^h 59^m 20.23 \\ &= 14^{\circ} 52.56' \\ \delta_b' &= 35.7 \quad 56.7 \\ \alpha - \delta_b' &= 16 \quad 55.9\end{aligned}$$

Estimated selenographic coords. of intermediate plates.

S.M.T.		λ	β	C
1301	12 ^h 57 ^m	$\lambda = -4.57$	$\beta = +2.21$	$C = -21.6$
1315	19 20 ^m	$\lambda = -4.42$	$\beta = +1.80$	$C = -23.3$

Sluff per hour = 0.022 0.064 0.27

Tplate	S.M.T.	λ	β	pos. of moon's axis
1301	12 ^h 57 ^m	-4.57	+2.21	-22
1302	13 17	-4.56	+2.19	-22
1303	13 33	-4.56	+2.17	-22
1304	14 53	-4.53	+2.08	-22
1305	15 22	-4.52	+2.04	-22
1307	16 26	-4.50	+1.98	-22
1308	16 40	-4.49	+1.97	-23
1309	16 55	-4.48	+1.96	-23
1310	17 38	-4.47	+1.91	-23
1311	17 54	-4.46	+1.89	-23
1312	18 09	-4.46	+1.87	-23
1313	18 52	-4.44	+1.83	-23
1314	19 06	-4.43	+1.81	-23
1315	19 20	-4.42	+1.80	-23

Conditional Equations

Residuals

	a	b	c	①		c	0-c
1	+ 0.28	- 2.04	+ 1.00	+ 47	+	8 + 13 + 58 = +79	- 32
2	0.00	- 2.06	+ 1.00	+ 81	+	0 + 13 + 58 = +71	+ 10
3	- 0.72	- 1.93	+ 1.00	+ 144	-	21 + 12 + 58 = +49	+ 95
4	- 1.72	- 1.12	+ 1.00	- 92	-	50 + 7 + 58 = +115	- 107
5	- 1.80	- 1.00	+ 1.00	+ 30	-	52 + 6 + 58 = +116	+ 18
6	- 2.06	+ 0.00	+ 1.00	- 69	-	60 + 0 + 58 = +118	- 67
7	- 1.80	+ 1.00	+ 1.00	+ 13	-	52 + 6 + 58 = +116	+ 13
8	- 1.72	+ 1.12	+ 1.00	+ 138	-	50 + 7 + 58 = +115	+ 137
9	- 0.72	+ 1.92	+ 1.00	- 22	-	21 + 12 + 58 = +25	- 47
10	0.00	+ 2.06	+ 1.00	+ 10	+	0 + 13 + 58 = +71	- 35
11	+ 0.28	+ 2.04	+ 1.00	+ 73	+	8 + 13 + 58 = +79	+ 20
							+ 293 - 288

Average = 53

Average without Haynes = 28

Formation of Normals

	ab	ac	bc
1	- 0.57	+ 13.2	- 96.0
2	- 0.00	+ 0.0	- 166.9
3	+ 1.39	- 102.9	- 277.8
4	+ 1.93	+ 158.0	+ 103.0
5	+ 1.80	- 54.0	- 20.0
6	- 0.00	+ 142.0	- 0.0
7	- 1.80	- 23.4	+ 13.0
8	- 1.93	- 237.3	+ 154.5
9	- 1.38	+ 15.8	- 42.3
10	+ 0.00	+ 0.0	+ 20.6
11	+ 0.57	+ 20.4	+ 145.8
	0.00	- 68.2	- 173.1

1301

$$\lambda = -4.57 \quad \beta = +2.81 \quad C = -22^\circ$$

	p	$p-c$	$\lambda \sin(p-c)$	$\beta \cos(p-c)$	θ	Corr. from λ	Corr. from β	θ	$\theta - C$
1	172	194	+1.1	-2.7	+4.1	+0.7	+64	+111	+47
2	180	202	+1.7	-2.6	+4.4	-0.1	-9	+72	+81
3	201	223	+3.1	-2.1	+5.5	-0.4	-37	+107	+144
4	237	259	+4.5	-0.5	+5.3	+0.9	+83	-9	-92
5	241	263	+4.5	-0.3	+5.1	-0.4	-37	-7	+30
6	270	292	+4.2	+1.1	+3.4	+0.6	+55	-14	-69
7	299	321	+2.9	+2.2	+1.0	-0.8	-74	-61	+13
8	303	325	+2.6	+2.3	+0.6	-1.0	-92	+46	+138
9	339	1	-0.1	+2.8	-2.6	+0.2	+18	-4	-22
10	0	22	-1.7	+2.6	-4.0	-0.2	-18	-8	+10
11	8	30	-2.3	+2.4	-4.4	+0.1	+9	+82	+73

Normal Equations

$$+17.62 + 0.00 - 9.98 = -68$$

$$0.00 + 27.72 + 0.00 = -173$$

$$-9.98 + 0.00 + 11.00 = +353$$

$$+9.98 + 0.00 - 5.59 = -38$$

$$+541 = +315$$

$$C = +58.3$$

$$+27.72 = -173 \quad \lambda = -62$$

$$+9.08$$

$$+9.98 = +321$$

$$+874$$

$$= +253$$

$$a = +28.9$$

1301

$$\begin{array}{r} X_0 = 18.7233 \\ \frac{1}{2}a \quad + \quad 14 \\ \hline 18.7247 \end{array}$$

$$\begin{array}{r} Y_0 = 22.0029 \\ \frac{1}{2}b = \quad - \quad 3 \\ \hline 22.0026 \end{array}$$

$$\begin{array}{r} R^2 = 4.2308 \\ c = \quad \quad 58 \\ \hline 4.2366 \end{array}$$

corrected for plate constant $\lambda = 1.66584$ $\gamma = 20.8121$

$$\bar{z} = -1.3416$$

$$\log \bar{z} = 0.12762 m$$

$$\text{wgs} = 999959$$

$$\text{wgs} = 8.50724$$

$$(\alpha - A) = 1.62079 m$$

$$\alpha - A = -41.76$$

$$\text{const } \Delta \alpha = -0.02$$

$$\eta = -1.1879$$

$$\eta_1 = +.1$$

$$\eta_0 = -1.1880$$

$$\log \eta_0 = 0.07482 m$$

$$\text{wgs} = 7.33115$$

$$(\delta - D) = 2.74367 m$$

$$\delta - D = -9.142$$

$$\text{const } \Delta \delta = +0.2$$

This is correction to original values of $\Delta \alpha$ & $\Delta \delta$.

Conditional Equations - Residuals

	a	b	c	0		c	0-c
1	+0.08	-2.06	+1	= +157	+ 5 + 29 + 79 = +	113	+44
2	-0.92	-1.84	+1	= +3	- 58 + 26 + 79 = +	47	-44
3	-1.57	-1.34	+1	= -92	-103 + 19 + 79 = -	5	-87
4	-	-	-	-			
5	-2.03	-0.34	+1	= +72	-123 + 5 + 79 = -	49	+121
6	-2.06	+0.00	+1	= -63	-136 - 0 + 79 = -	57	-6
7	-1.95	+0.66	+1	= -83	-128 - 9 + 79 = -	58	-25
8	-1.92	+0.76	+1	= -16	-126 - 11 + 79 = -	58	+42
9	-1.21	+1.66	+1	= -64	-80 - 24 + 79 = -	25	-39
10	-0.92	+1.84	+1	= -51	-158 - 26 + 79 = -	5	-46
11	+0.08	+2.06	+1	= +88	+ 5 - 29 + 79 = +	55	+33

+240 - 247

Average = 49 =

Old Average = 42

Formation of Normals

	ab		am		bm
1	-0.17	+	12.6	-	325.5
2	+1.69	-	2.8	-	5.5
3	+2.10	+	144.5	+	123.2
5	+0.69	-	146.2	-	24.5
6	-0.00	+	129.8	-	0.0
7	-1.29	+	162.0	-	54.8
8	-1.46	+	30.7	-	12.2
9	-20.1	+	77.4	-	105.5
10	-1.69	+	46.9	-	93.8
11	+0.17	+	7.0	+	151.2
	-1.97	+	461.9	-	317.4

$$1302- \quad \lambda = -4.56 \quad \beta = +2.79 \quad c = -22^\circ$$

	P	$P-C$	$\lambda \sin(P-C)$	$\beta \cos(P-C)$	L	Haykin	Correcting	O	$O-C$
1	178	200	+1.6	-2.6	+4.5	-0.2	-18	+139	+157
2	207	229	+3.4	-1.8	+5.5	-0.3	-28	-25	+3
3	230	252	+4.3	-0.9	+5.5	+1.3	+120	+28	-92
4	260	272	+4.5	+0.1	+4.7	-1.4	-129	-356	-227
5	261	283	+4.4	+0.6	+4.1	-0.8	-74	-2	+72
6	270	292	+4.2	+1.0	+3.5	+0.6	+55	-8	-63
7	289	311	+3.4	+1.8	+1.9	+1.1	+101	+18	-83
8	292	314	+3.3	+1.9	+1.7	+0.9	+83	+67	-16
9	324	346	+1.1	+2.7	-1.3	-0.2	-18	-82	-64
10	335	357	+0.2	+2.8	-2.3	+0.1	+9	-42	-51
11	358	20	-1.6	+2.6	-3.9	-0.2	-18	+70	+88

Normal Equations

$$+2148 - 1.97 = 12.42 = +462$$

$$- 1.97 + 20.96 + 1.40 = -317$$

$$- 12.42 + 1.40 + 10.00 = -49$$

$$+ 1.97 - 0.18 - 1.14 = +42$$

$$+ 12.42 - 1.14 - 7.20 = +268$$

$$+ 20.78 + 0.26 = -275$$

$$+ 0.26 + 2.80 = +219$$

$$- 0.26 - 0.00 = +3$$

$$+ 2.80 = +222$$

$$c = +79.4$$

$$- 0.02 - 0.26 = -20$$

$$+ 20.76 = -295$$

$$b = -14.2$$

$$- 15.43 + 1.74 + 12.42 = -61$$

$$+ 1.74 - 0.20 - 1.40 = +7$$

$$+ 6.05 - 0.23 = +401$$

$$- 0.23 + 20.76 = -310$$

$$- 0.00 + 0.23 = -3$$

$$+ 6.05 = +398$$

$$a = +658$$

$$+ 2.79 - 20.96 - 132$$

$$\Delta x = 2.06 \times 0.58 = +1.19$$

1302

$$\begin{array}{r}
 X_0 = 18.9169 \\
 \frac{1}{2}a = \quad + 33 \\
 \hline
 18.9202
 \end{array}
 \qquad
 \begin{array}{r}
 Y_0 = 22.3383 \\
 \frac{1}{2}b = \quad - 7 \\
 \hline
 22.3376
 \end{array}$$

$$\begin{array}{r}
 R^2 = 4.2437 \\
 c = \quad + 79 \\
 \hline
 4.2516
 \end{array}$$

Correction for plate constant $X = 17.6719$ $Y = 21.5251$

$$\bar{z} = -0.3281$$

$$\log \bar{z} = 9.51601m$$

$$- \log s = 9.99955$$

$$- \log t = 8.50724$$

$$\text{corr. to } \Delta S = 0$$

$$"(x-A) = 1.00922m$$

$$x-A = \quad - \quad 10.21$$

$$\text{correction to } \Delta x = +0.06$$

Conditional Equations.

Residuals

	a	b	c	0		c	0-c
1	0.00	-2.06	+1.2	+4.9	+	0 + 1.4 + 7.8 = +9.2	-4.3
2	-0.26	-2.04	+1.2	+5.0	-	1.8 + 1.3 + 7.8 = +7.3	-2.3
3	-1.21	-1.67	+1.2	+3.6	-	8.5 + 1.1 + 7.8 = +4	+3.2
4	-1.26	-1.63	+1.2	+7.0	-	8.8 + 1.1 + 7.8 = +1	+6.9
5	-1.94	-0.67	+1.2	-9.1	-	13.6 + 4 + 7.8 = -5.4	-3.7
6	-2.06	+0.00	+1.2	-2.8	-	14.8 - 0 + 7.8 = -7.0	+4.2
7	-1.90	+0.80	+1.2	-6.8	-	13.3 - 5 + 7.8 = -6.0	-8
8	-1.57	+1.33	+1.2	-10.5	-	11.0 - 9 + 7.8 = -4.1	-6.4
9	-1.26	+1.63	+1.2	-4.2	-	8.8 - 1.1 + 7.8 = -2.1	-2.1
10	-0.26	+2.05	+1.2	+1.6	-	1.8 - 1.4 + 7.8 = +4.6	+7.0
11	0.00	+2.06	+1.2	+5.4	+	0 - 1.4 + 7.8 = +6.4	-1.0

4213-206

Average = 38

Formation of Nouns

	ab	am	bn
1	- 0.00	+ 0.0	- 101.0
2	+ 0.53	- 130	- 102.0
3	+ 2.02	- 43.6	- 60.1
4	+ 2.05	- 88.2	- 104.0
5	+ 13.0	+ 176.1	+ 61.0
6	- 6.00	+ 57.7	- 0.0
7	- 1.52	+ 129.2	- 54.4
8	- 2.09	+ 165.0	- 139.6
9	- 2.05	+ 52.9	- 68.5
10	- 0.53	- 31.5	+ 237.5
11	- 0.00	+ 0.0	+ 111.2
	<u>- 0.29</u>	<u>+ 404.6</u>	<u>- 219.9</u>

1303- $\lambda = -4^{\circ}16$ $\beta = +27^{\circ}7$ $C = -22$

	ρ	$\rho - C$	$\lambda \sin(\rho - C)$	$\beta \cos(\rho - C)$	ρ	Height	Long.	O	$O - C$
1	180	202	+1.7	-2.6	+4.6	-0.1	-9	+40	+49
2	187	209	+2.2	-2.4	+4.9	-0.3	-28	+22	+50
3	216	238	+3.9	-1.5	+5.7	0.0	0	+26	+36
4	218	240	+4.0	-1.4	+5.7	+1.0	+92	+162	+70
5	251	273	+4.5	+0.1	+4.7	-1.0	-92	-183	-91
6	270	292	+4.2	+1.0	+3.5	+0.6	+55	+27	-28
7	290	312	+3.4	+1.8	+1.9	+0.8	+74	+6	-68
8	310	332	+2.1	+2.4	0.0	-1.6	-147	-252	-105
9	323	345	+1.2	+2.7	-1.2	+0.1	+9	-33	-42
10	353	15	-1.2	+2.7	-3.6	+0.2	+28	+134	+116
11	0	22	-1.7	+2.6	-4.0	-0.2	-18	+36	+54

Normal Equations

$$\begin{aligned}
 +18.87 - 0.29 - 11.72 &= +405 \\
 -0.29 + 27.83 - 0.20 &= -220 \\
 -11.72 - 0.26 + 11.00 &= +41
 \end{aligned}$$

$$\begin{aligned}
 +0.29 - 0.00 - 0.18 &= +6 \\
 +11.72 - 0.18 - 7.29 &= +252
 \end{aligned}$$

$$+27.83 - 0.38 = -214$$

$$-0.38 + 3.71 = +293$$

$$+0.38 - 0.01 = -3$$

$$+3.70 = +290$$

$$C = +78.4$$

$$-0.04 + 0.38 = +30$$

$$+27.79 = -184$$

$$t = -6.6$$

$$-12.50 - 0.21 + 11.72 = +44$$

$$-0.21 - 0.00 + 0.20 = +1$$

$$+6.37 - 0.50 = +449$$

$$-0.50 + 27.83 = -219$$

$$-0.01 + 0.50 = +4$$

$$+6.36 = +445$$

$$a = +70.0$$

Cu

1303

$$\begin{array}{r} X_0 = 182629 \\ \frac{1}{2}a = +35 \\ \hline 182664 \end{array} \quad \begin{array}{r} Y_0 = 226718 \\ \frac{1}{2}b = -3 \\ \hline 226715 \end{array}$$

$$\begin{array}{r} R^2 = 4246.2 \\ c = +78 \\ \hline 42540 \end{array}$$

Corrected for plate constant $X = 1844.07$ $Y = 22.0882$

$$\bar{z} = +0.4407$$

$$\eta = +0.0882$$

$$\log \bar{z} = 9.64414$$

$$\log \eta = 8.94547$$

$$\text{const} = 9.99953$$

$$\text{const} = 7.33115$$

$$\text{const} = 8.50724$$

$$\therefore (\bar{z} - D) = 1.61432$$

$$\therefore (x - A) = 1.13737$$

$$x - A = +13.72$$

$$s - D = +41.1$$

$$\text{const } \Delta x = 0$$

$$\text{const } \Delta s = 0.1$$

Conditional Equations

		C	O-C
1	$+ 0.00 - 2.07 + 1 = + 4.6$	$+ 0 + 2 - 18 = -16$	$+ 6.2$
2	$- 0.21 - 2.06 + 1 = + 3.7$	$- 2 + 2 - 18 = -18$	$+ 9.5$
3	$- 1.21 - 1.68 + 1 = - 5.5$	$- 11 + 1 - 18 = -28$	$- 2.7$
4	$- 1.57 - 1.35 + 1 = - 5.8$	$- 14 + 1 - 18 = -31$	$- 2.7$
5	$- 2.04 - 0.35 + 1 = - 8.1$	$- 19 + 0 - 18 = -37$	$- 4.4$
6	$- 2.07 + 0.00 + 1 = - 1.5$	$- 19 - 0 - 18 = -37$	$- 8.8$
7	$- 1.96 + 0.65 + 1 = - 1.28$	$- 18 - 1 - 18 = -37$	$- 9.1$
8	$- 1.26 + 1.65 + 1 = + 5.1$	$- 15 - 1 - 18 = -34$	$+ 8.5$
9	$- 1.21 + 1.68 + 1 = + 1.03$	$- 11 - 1 - 18 = -30$	$+ 13.3$
10	$- 0.21 + 2.06 + 1 = + 3.5$	$- 2 - 2 - 18 = -22$	$+ 5.7$
11	$+ 0.00 + 2.07 + 1 = - 3.2$	$+ 0 - 2 - 18 = -20$	$- 1.2$
12	$+ 0.79 + 1.91 + 1 = - 5.2$	$+ 7 - 2 - 18 = -13$	$- 3.9$
13	$+ 1.25 + 1.65 + 1 = - 1$	$+ 11 - 1 - 18 = -8$	$+ 7$
14	$+ 1.79 + 1.03 + 1 = + 9$	$+ 16 - 1 - 18 = -3$	$+ 1.2$
15	$+ 1.97 + 0.65 + 1 = - 1.08$	$+ 18 - 1 - 18 = -1$	$- 1.07$
16	$+ 2.06 + 0.00 + 1 = - 6.3$	$+ 19 - 0 - 18 = + 1$	$- 6.2$
17	$+ 2.04 - 0.35 + 1 = + 2.5$	$+ 19 + 0 - 18 = + 1$	$+ 2.4$
18	$+ 1.79 - 1.03 + 1 = + 3.7$	$+ 16 + 1 - 18 = -1$	$+ 3.8$
19	$+ 1.57 - 1.35 + 1 = - 9$	$+ 14 + 1 - 18 = -3$	$- 6$

Formation of Normals.

 $+ 513 - 503$
 Average = 53

1	$- 0.00$	$+ 0.0$	$- 95.2$
2	$+ 0.43$	$- 16.2$	$- 158.6$
3	$+ 2.03$	$+ 65.5$	$+ 92.5$
4	$+ 2.12$	$+ 91.0$	$+ 78.3$
5	$+ 0.71$	$+ 165.0$	$+ 28.3$
6	$- 0.00$	$+ 259.0$	$- 0.0$
7	$- 1.27$	$+ 251.0$	$- 83.3$
8	$- 2.08$	$- 64.3$	$+ 84.1$
9	$- 2.03$	$- 124.5$	$+ 173.0$
10	$- 0.43$	$- 7.4$	$+ 72.1$
11	$+ 0.00$	$- 0.0$	$- 66.3$
12	$+ 1.51$	$- 41.0$	$- 99.3$
13	$+ 2.06$	$- 1.2$	$- 1.6$
14	$+ 1.84$	$+ 16.1$	$+ 9.3$
15	$+ 1.28$	$- 212.8$	$- 70.2$
16	$+ 0.00$	$- 129.8$	$- 0.0$
17	$- 0.71$	$+ 51.0$	$- 8.8$
18	$- 1.84$	$+ 66.2$	$- 38.1$
19	$- 2.12$	$- 14.1$	$+ 12.1$
	$+ 1.50$	$+ 353.5$	$- 71.7$

1304	$\lambda = -4^{\circ}53$	$\beta = +2^{\circ}6.8$	$C = -22$						
p	$p-c$	$\lambda_{\text{cor}}(p-c)$	$\beta_{\text{cor}}(p-c)$	λ	β	Hayn's Corr.	0	$0-c$	
1	180°	202°	+ 1.7	- 2.5	+ 4.5	- 0.1	- 9	+ 3.7	+ 46
2	186	208	+ 2.1	- 2.4	+ 4.8	- 0.4	- 37	+ 40	+ 77
3	216	238	+ 3.8	- 1.4	+ 5.5	- 0.0	0	- 5.5	- 55
4	229	251	+ 4.3	- 0.9	+ 5.5	+ 0.9	+ 83	+ 25	- 58
5	260	282	+ 4.4	+ 0.6	+ 4.1	- 0.3	- 28	- 109	- 81
6	270	292	+ 4.2	+ 1.0	+ 3.5	+ 0.6	+ 55	- 70	- 125
7	288	310	+ 3.5	+ 1.7	+ 2.1	+ 0.6	+ 55	- 73	- 128
8	323	345	+ 1.2	+ 2.6	- 1.1	+ 0.1	+ 9	+ 60	+ 51
9	324	346	+ 1.1	+ 2.7	- 1.3	- 0.0	0	+ 103	+ 103
10	354	16	- 1.2	+ 2.6	- 3.5	+ 0.1	+ 9	+ 44	+ 35
11	0	22	- 1.7	+ 2.5	- 3.9	- 0.2	- 18	- 150	- 32
12	23	45	- 3.2	+ 1.9	- 4.8	0.0	0	- 152	- 52
13	37	59	- 3.9	+ 1.4	- 5.0	- 0.6	- 55	- 56	- 1
14	60	82	- 4.5	+ 0.4	- 4.6	+ 0.8	+ 74	+ 83	+ 9
15	72	94	- 4.5	- 0.2	- 4.0	+ 1.4	+ 124	+ 21	- 108
16	90	112	- 4.2	- 1.0	- 2.9	- 2.0	- 184	- 243	- 63
17	100	122	- 3.8	- 1.4	- 2.1	+ 0.1	+ 9	+ 34	+ 25
18	120	142	- 2.8	- 2.1	- 0.4	- 1.4	- 124	- 92	+ 37
19	131	153	- 2.1	- 2.4	+ 0.4	+ 1.8	+ 120	+ 111	- 9

$+ 4 \cdot 2.68 + 1.50 + 1.52 = + 354$
 $+ 1.50 + 38.66 + 3.11 = - 72$
 $+ 1.52 + 3.11 + 19.00 = - 329$

$- 1.50 - 0.05 - 0.05 = - 12$
 $- 1.52 - 0.05 - 0.05 = - 13$

$+ 38.61 + 30.62 = 69$

$+ 30.6 + 18.95 = 49.55$

$- 30.6 - 0.24 = - 30.84$

$+ 18.71 = - 335$

$- 0.49 - 30.6 = - 31.09$

$+ 38.12 = - 29$

$C = - 17.9$

$b = - 0.8$

$- 0.12 - 0.25 - 1.52 = - 1.89$

$- 0.25 - 0.51 - 3.11 = - 3.87$

$+ 42.56 + 12.5 = 55.06$

$+ 1.25 + 38.15 = 39.4$

$- 0.04 - 1.25 = - 1.29$

$+ 42.52 = 41.23$

$a = + 9.2$

$- 10.98 - 38.66 - 39 = - 88.64$

$2.06 \times - 0.032 = - 0.07$

~~104~~
 $X_0 =$

1204

$$X_0 = 18.2055$$

$$\frac{1}{2} \Delta X = + 5$$

$$\text{corr } \pm \Delta X = 0$$

$$Y_0 = 22.3546$$

$$\frac{1}{2} \Delta Y = 0$$

$$22.3546$$

$$R^2 = 4.2826$$

$$\text{corrected for plate constant } \varphi = 24.9350$$

$$\eta = +2.9350$$

$$\eta_1 = + 1.0$$

$$\eta_0 = +2.9340$$

$$\log \eta_0 = 0.46746$$

$$\text{const} = 733115$$

$$(u-D) = 3.13631$$

$$s-D = +22.487$$

$$\text{corr } \pm \Delta s = + 0.3$$

Conditional Equations

1	+ 0.10	-2.07	+1	= +196
2	-0.90	-1.87	+1	= +44
3	-1.54	-1.29	+1	= -27
4	-1.90	-0.82	+1	= +11
5	-2.05	-0.39	+1	= -1
6	-2.07	+0.00	+1	= -72
7	-1.98	+0.61	+1	= -118
8	-1.90	+0.83	+1	= -65
9	-1.30	+1.61	+1	= -41
10	-0.90	+1.87	+1	= -26
11	+0.00	+2.07	+1	= -54
12	+0.10	+2.07	+1	= +68
13	+0.10	+1.75	+1	= +41
14	+1.30	+1.61	+1	= +68
15	+1.98	+0.61	+1	= -58
16	+2.06	+0.00	+1	= -50
17	+2.03	-0.39	+1	= -105
18	+1.54	-0.39	+1	= -55
19	+1.10	-1.75	+1	= +115

1	+ 1	+ 3	-3	= +31
2	- 7	+ 3	-3	= +20
3	- 12	+ 2	-3	= + 7
4	- 14	+ 1	-3	= - 4
5	- 15	+ 6	-3	= -12
6	- 16	- 0	-3	= -19
7	- 15	- 10	-3	= -28
8	- 14	- 13	-3	= -30
9	- 10	- 26	-3	= -39
10	- 7	- 30	-3	= -40
11	+ 0	- 33	-3	= -36
12	+ 1	- 33	-3	= -35
13	+ 8	- 28	-3	= -23
14	+ 10	- 26	-3	= -19
15	+ 15	- 10	-3	= + 2
16	+ 15	- 0	-3	= +12
17	+ 15	+ 6	-3	= +18
18	+ 12	+ 22	-3	= +31
19	+ 8	+ 28	-3	= +33

D-C

+ 165
+ 24
- 34
- 15
+ 11
- 53
- 90
- 35
- 2
+ 14
- 18
+ 103
+ 64
+ 87
- 60
- 62
- 123
- 86
+ 82

Formation of Normals

at	an	bn
1	-0.21	+ 19.6
2	+1.68	- 39.6
3	+2.14	+ 44.7
4	+1.56	- 20.9
5	+0.79	+ 2.0
6	-0.00	+ 149.0
7	-1.21	+ 233.8
8	-1.57	+ 123.5
9	-2.09	+ 53.3
10	-1.68	+ 23.4
11	+0.00	- 0.0
12	+0.21	+ 6.8
13	+1.93	+ 45.1
14	+2.09	+ 68.5
15	+1.21	- 115.0
16	+0.00	- 103.0
17	-0.79	- 213.0
18	-2.14	- 84.7
19	-1.93	+ 126.7
0.00	+340.2	-608.8

+565-563
Average: 59

1305		$\lambda = -4^{\circ}52'$		$\beta = +2^{\circ}64'$		$C = -22^{\circ}$			
P	P-C	λ (refl)	β (refl)	λ	β	Hayden Curve	O	O-C	
1	1770	1990	+1.5	-2.5	+4.3	+0.2	+18	+214	+196
2	206	228	+3.4	-1.8	+5.5	-0.3	-28	+16	+44
3	228	250	+4.2	-0.9	+5.4	+0.5	+46	+19	-27
4	247	269	+4.5	-0.0	+4.8	-1.9	-175	-164	+11
5	256	278	+4.5	+0.4	+4.4	+0.1	+9	+8	-1
6	270	292	+4.2	+1.0	+3.5	+0.6	+55	-17	-72
7	287	309	+3.5	+1.7	+2.1	+0.9	+83	-25	-118
8	294	316	+3.1	+1.9	+1.5	+1.4	+129	+64	-65
9	321	343	+1.3	+2.5	-0.9	-0.4	-37	-78	-41
10	334	356	+0.3	+2.6	-2.0	-0.0	-0	-26	-26
11	0	22	-1.7	+2.5	-3.9	-0.2	-18	-72	-54
12	3	25	-2.9	+2.4	-5.0	-0.3	-28	+40	+68
13	32	54	-3.7	+1.6	-5.0	-0.8	-94	-33	+41
14	39	61	-4.0	+1.3	-5.0	-0.2	-18	+50	+68
15	73	95	-4.5	-0.2	-4.0	+1.0	+92	+24	-58
16	90	112	-4.2	-1.0	-2.9	-2.0	-184	-234	-50
17	102	124	-3.7	-1.5	-1.9	+0.5	+46	-59	-105
18	132	154	-2.0	-2.4	+0.7	-1.2	+110	+15	-55
19	148	170	-0.8	-2.6	+2.1	-1.4	-179	-14	+115

Normals -

$$\begin{aligned}
 +44.01 - 0.00 - 321 &= +340 \\
 -00.00 + 37.43 + 2.96 &= -609 \\
 -321 + 2.96 + 19.00 &= -129
 \end{aligned}$$

$$\begin{aligned}
 0.00 - 0.00 - 0.00 &= 0 \\
 +321 - 0.00 - 0.23 &= +25
 \end{aligned}$$

$$\begin{aligned}
 +37.43 + 2.96 &= -609 \\
 +2.96 + 18.77 &= -104
 \end{aligned}$$

$$\begin{aligned}
 -2.96 - 0.23 &= +48 \\
 +18.54 &= -56
 \end{aligned}$$

$$\begin{aligned}
 -0.47 - 2.96 &= +16 \\
 +36.96 &= -593
 \end{aligned}$$

$$C = -3.0$$

$$A = -16.1$$

$$\begin{aligned}
 -0.54 + 0.50 + 3.21 &= -22 \\
 +0.50 - 0.46 - 2.96 &= +20
 \end{aligned}$$

$$\begin{aligned}
 +43.47 + 0.50 &= +318 \\
 +0.50 + 36.97 &= -589
 \end{aligned}$$

$$-0.01 - 0.50 = +8$$

$$+43.46 = +326$$

$$a = +7.5$$

$$-37.43$$

1305

$$\begin{array}{r} X_0 = 17.8974 \\ \frac{1}{2} \Delta \alpha = \quad + \quad 4 \\ \hline 17.8978 \end{array}$$

$$\begin{array}{r} Y_0 = 22.3880 \\ \frac{1}{2} \Delta \delta = \quad - \quad 8 \\ \hline 22.3872 \end{array}$$

$$\begin{array}{r} R^2 = 4.2879 \\ \quad \quad - 3 \\ \hline 4.2876 \end{array}$$

Corrected for plate constants $X = 15.7686$ $Y = 19.9399$

$$\bar{z} = -2.2314$$

$$\eta = -2.0601$$

$$\eta_1 = \quad + \quad 3$$

$$\log \bar{z} = 0.34858m$$

$$\log \eta_1 = 9.99934$$

$$\log \eta_0 = 8.50724$$

$$\eta_0 = -2.0604$$

$$\log \eta_0 = 0.31395m$$

$$\log \eta_1 = 7.33115$$

$$\log (\alpha - A) = 1.84200m$$

$$\log (\delta - D) = 2.98280m$$

$$\alpha - A = \quad - \quad 1 \quad 09.50$$

$$\delta - D = \quad - \quad 16 \quad 01.2$$

$$\text{corr } \Delta \alpha = \quad 0$$

$$\text{corr } \Delta \delta = \quad + \quad 0.2$$

1307 Conditional Equating

Residuals

C

O-C

1	+0.00-2.08 = +94	+0+30+100 = +40	+54
2	-0.18-2.07 = +100	-5+30+100 = +35	+65
3	-1.18-1.20 = -2	-30+25+10 = +5	-7
4	-1.31-1.61 = -10	-34+23+10 = -1	-9
5	-1.98-0.61 = -1.08	-51+9+10 = -32	-76
6	-2.07+0.00 = -53	-53-0+10 = -43	-10
7	-2.03+0.39 = -88	-52-6+10 = -48	-40
8	-1.53+1.39 = -1	-39-20+10 = -49	+48
9	-1.18+1.70 = -1.25	-30-25+10 = -45	-80
10	-0.18+2.07 = +1.00	-5-30+10 = -25	+1.25
11	+0.00+2.07 = +2.07	+0-30+10 = -20	+6.5
12	+0.82+1.91 = +2.73	+21-28+10 = +3	-17
13	+1.53+1.39 = +2.92	+39-20+10 = +29	-74
14	+1.82+1.01 = +2.83	+47-15+10 = +42	+37
15	+2.04+0.39 = +2.43	+53-6+10 = +57	+16
16	+2.07+0.00 = +2.07	+53-0+10 = +63	-75
17	+1.99-0.61 = +1.38	+51+9+10 = +70	-93
18	+1.82-1.00 = +0.82	+47+15+10 = +72	+32
19	+1.31-1.61 = -0.30	+34+23+10 = +67	+41

Formation of norms

+483-481

Average = 51

	at	an	ln
1	-0.00	+0.0	-195.5
2	+0.37	-18.0	-207.0
3	+2.01	+2.4	+3.4
4	+2.14	+13.1	+16.1
5	+1.21	+213.5	+66.0
6	-0.00	+109.5	-0.0
7	-0.79	+178.5	-34.3
8	-2.13	+1.5	-1.4
9	-2.01	+147.8	-212.3
10	-0.37	-18.0	+207.0
11	+0.00	+0.0	+93.2
12	+1.57	-11.5	-26.7
13	+2.13	-68.9	-62.5
14	+1.84	+143.8	+80.0
15	+0.79	+146.9	+28.5
16	+0.00	-24.9	-6.0
17	-1.21	-45.7	+14.0
18	-1.84	+189.2	-104.0
19	-2.11	+141.5	-174.0
	+1.57	+1102.7	-509.5

1307		$\lambda = -4.50$		$\beta = +2.58$		$C = -22^\circ$			
P	P-C	$\lambda \sin(A-C)$	$\beta \cos(A-C)$	D	Hagen's Corr.	O	O-C		
1	180	202	+1.7	-2.4	+4.4	-0.1 -9	+8.5	+9.4	
2	185	207	+2.0	-2.3	+4.4	-0.2 -18	+8.2	+10.0	
5	215	237	+3.8	-1.4	+5.5	-0.3 -28	-3.0	-2	
4	219	241	+3.9	-1.3	+5.5	+1.0 +92	+8.2	-1.0	
5	253	275	+4.5	+0.2	+4.6	+0.1 +9	-9.9	-10.8	
6	270	292	+4.2	+1.0	+3.5	+0.6 +55	+2	-5.3	
7	282	304	+3.7	+1.4	+2.6	+0.4 +37	-5.1	-8.8	
8	312	334	+2.0	+2.3	0.0	-0.4 -37	-3.6	+1	
9	325	347	+1.0	+2.5	-1.2	-0.4 -37	-1.62	-12.5	
10	355	17	-1.3	+2.5	-3.5	-0.1 -9	+9.1	+10.0	
11	0	22	-1.7	+2.4	-3.8	-0.2 -18	+2.7	+4.5	
12	23	45	-3.2	+1.8	-4.7	0.0 0	-1.4	-1.4	
13	48	70	-4.2	+0.9	-4.8	+0.2 +18	-2.7	-4.5	
14	61	83	-4.5	+0.3	-4.5	+0.8 +74	+15.3	+7.9	
15	78	100	-4.4	-0.4	-3.7	-0.6 -55	+1.8	+7.3	
16	90	112	-4.2	-1.0	-2.9	-2.0 -184	-19.6	-1.2	
17	107	129	-3.5	-1.6	-1.6	+1.2 +110	+8.7	-2.3	
18	119	141	-2.8	-2.0	-0.5	-1.4 -122	-2.5	+10.4	
19	141	163	-1.3	-2.5	+1.5	-1.0 -92	+1.6	+10.8	

Normal Equations

$$\begin{aligned}
 +43.02 + 1.57 + 1.76 &= +110.3 \\
 +1.57 + 38.68 + 1.03 &= -51.0 \\
 +1.76 + 1.03 + 19.00 &= +22.2 \\
 -1.57 - 0.06 - 0.06 &= -4.0 \\
 -1.76 - 0.06 - 0.07 &= -4.5
 \end{aligned}$$

$$\begin{aligned}
 +38.62 + 1.00 &= -55.0 \\
 +1.00 + 18.93 &= +17.7
 \end{aligned}$$

$$\begin{aligned}
 -1.00 - 0.03 &= +1.4 \\
 +18.90 &= +19.2
 \end{aligned}$$

$$C = +10.1$$

$$\begin{aligned}
 -0.05 - 1.00 &= -9 \\
 +38.57 &= -56.0
 \end{aligned}$$

$$b = -14.5$$

$$\begin{aligned}
 -0.16 - 0.10 - 1.76 &= -2.1 \\
 -0.10 - 0.06 - 1.03 &= -1.2
 \end{aligned}$$

$$\begin{aligned}
 +42.86 + 1.47 &= +10.82 \\
 +1.47 + 38.62 &= -52.2
 \end{aligned}$$

$$\begin{aligned}
 -0.06 - 1.47 &= -2.0
 \end{aligned}$$

$$+42.80 = +110.2$$

$$a = +25.8$$

$$-105.9 - 38.68 - 4.3$$

$$\Delta_1 = -$$

13071

$$X_0 = 18.1834 \quad Y_0 = 21.6060$$

$$z_0 = +13 \quad \mu_0 = -7$$

$$18.1847 \quad 21.6053$$

$$R^2 = 4.2996$$

$$+10$$

$$43006$$

Corrected for plate constants $X = 18.4649 \quad Y = 22.1874$

$$z = +0.4649$$

$$\eta = +0.1874$$

$$\log z = 9.66736$$

$$\dots \log s = 9.99921$$

$$8.50724$$

$$\dots (\alpha - A) = 1.16091$$

$$\log \eta = 9.27277$$

$$7.33115$$

$$\dots (\delta - D) = 1.94162$$

$$\alpha - A = +14.48$$

$$\delta - D = +127.4$$

$$\text{corr to } \Delta \alpha = 00$$

$$\text{corr to } \Delta \delta = +0.2$$

Conditional Eq. 0			Residuals			O-C		
1	+0.00	-2.073 + 92	+	0	+21+30 = +51	+	41	1
2	-0.34	-2.04 = +81	-	7	+20+30 = +43	+	38	2
3	-0.89	-1.87 = +75	-	19	+19+30 = +30	+	45	3
4	-1.34	-1.58 = +78	-	29	+16+30 = +17	+	61	4
5	-1.88	-0.87 = -4	-	41	+9+30 = -2	-	2	5
6	-2.07	+0.00 = -82	-	45	-0+30 = -15	-	67	6
7	-2.07	+0.13 = -125	-	45	-1+30 = -16	-	109	7
8	-1.74	+1.13 = +22	-	38	-11+30 = -19	+	41	8
9	-1.34	+1.58 = -14	-	29	-16+30 = -15	+	1	9
10	-0.34	+2.04 = -62	-	7	-20+30 = +3	-	65	10
11	+0.00	+2.07 = +129	+	0	-21+30 = +9	+	120	11
12	+0.66	+1.97 = +56	+	14	-20+30 = +24	+	32	12
13	+1.54	+1.89 = +45	+	33	-14+30 = +49	-	4	13
14	+2.07	+0.13 = +109	+	45	-1+30 = +74	+	35	14
15	+2.07	+0.00 = -38	+	45	-0+30 = +75	-	113	15
16	+1.88	-0.87 = +170	+	41	+9+30 = +80	+	90	16
17	+1.66	-1.25 = -34	+	36	+12+30 = +78	-	112	17
18	+0.66	-1.97 = +27	+	14	+20+30 = +64	-	37	18
						+504 = 509		
						Average: 56		

Formation of harmonics

	ab		an		bn
1	-0.00	+	0.0	-	190.5
2	+0.69	-	27.5	-	165.2
3	+1.66	-	66.7	-	140.1
4	+2.12	-	104.5	-	123.0
5	+1.63	+	7.5	+	3.5
6	-0.00	+	170.0	-	0.0
7	-0.27	+	259.0	-	16.3
8	-1.97	-	38.3	+	24.9
9	-2.12	+	18.8	-	22.1
10	-0.69	+	21.1	-	126.5
11	+0.00	+	0.0	+	267.0
12	+1.30	+	36.9	+	110.2
13	+2.14	+	69.4	+	62.5
14	+0.27	+	226.0	+	14.2
15	+0.00	-	78.6	-	0.0
16	-1.63	+	319.5	-	148.0
17	-2.01	-	54.8	+	42.5
18	-1.30	+	17.8	-	53.2
19		+	775.6		

	130°	$\lambda = -4^\circ 49'$	$\beta = +2^\circ 56'$	$C = -23^\circ$					
	P	$P-C$	$\lambda \sin(P-C)$	$\beta \cos(P-C)$	19	Hayn Corr.	0	$0-C$	
1	180	203	+ 1.8	- 2.4	+ 4.5	- 0.3 - 28	+ 64	+ 92	
2	189	212	+ 2.4	- 2.2	+ 4.9	- 0.4 - 37	+ 44	+ 81	
3	205	228	+ 3.3	- 1.7	+ 5.3	- 0.3 - 28	+ 47	+ 75	
4	220	243	+ 4.0	- 1.2	+ 5.5	+ 0.4 + 37	+ 115	+ 78	
5	245	268	+ 4.5	- 0.1	+ 4.9	- 1.9 - 175	- 179	- 4	
6	270	293	+ 4.1	+ 1.0	+ 3.4	+ 0.5 + 46	+ 36	- 82	
7	274	297	+ 4.0	+ 1.2	+ 3.1	+ 0.7 + 64	- 61	- 125	
8	303	326	+ 2.5	+ 2.1	+ 0.7	- 1.1 - 101	- 79	+ 22	
9	320	343	+ 1.3	+ 2.5	- 0.9	- 0.4 - 37	- 51	- 14	
10	351	374	- 1.1	+ 2.5	- 3.3	+ 0.2 + 18	- 44	- 62	
11	0	23	- 1.8	+ 2.4	- 3.9	- 0.3 - 28	+ 101	+ 129	
12	19	42	- 3.0	+ 1.6	- 4.3	+ 0.1 + 9	+ 65	+ 56	
13	48	71	- 4.2	+ 0.8	- 4.7	+ 0.4 + 37	+ 82	+ 45	
14	86	109	- 4.2	- 0.8	- 3.1	- 2.5 - 230	- 121	+ 109	
15	90	113	- 4.1	- 1.0	- 2.8	- 1.9 - 175	- 213	- 38	
16	115	138	- 3.0	- 1.9	- 0.8	- 1.1 - 101	+ 69	+ 170	
17	127	150	- 2.2	- 2.2	+ 0.3	+ 1.5 + 138	+ 104	- 34	
18	161	184	+ 0.3	- 2.5	+ 3.1	+ 1.9 + 175	+ 262	+ 27	

corrections

$$\begin{aligned}
 + 37.81 - 0.28 - 1.47 &= + 77.6 \\
 - 0.28 + 39.52 - 2.08 &= - 46.0 \\
 - 1.47 - 2.08 + 18.00 &= + 52.5
 \end{aligned}$$

$$\begin{aligned}
 + 0.18 - 0.00 - 0.01 &= + 4 \\
 + 1.47 - 0.01 - 0.06 &= + 30
 \end{aligned}$$

$$\begin{aligned}
 + 39.52 - 2.09 &= - 45.6 \\
 - 2.09 + 17.94 &= + 55.5
 \end{aligned}$$

$$\begin{aligned}
 + 2.09 - 0.11 &= - 24 \\
 + 17.83 &= + 531
 \end{aligned}$$

$$C = + 29.8$$

$$- 0.24 + 2.09 = + 65$$

$$+ 39.28 - 391$$

$$b = - 10.0$$

$$- 0.12 - 0.17 + 1.47 = + 43$$

$$- 0.17 - 0.24 + 2.08 = + 61$$

$$+ 37.69 - 0.35 = + 819$$

$$- 0.35 + 39.28 = - 399$$

$$- 0.00 + 0.35 = - 4$$

$$+ 37.69 = + 815$$

$$a = + 21.6$$

1308

$$X_0 = 17.3414$$

$$\frac{1}{2}a = +11$$

$$173425$$

$$Y_0 = 21.8731$$

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

$$218726$$

$$R^2 = 42968$$

$$c = +30$$

$$42998$$

Corrected for plate constants $X = 19.0600$ $Y = 22.6887$

$$\bar{z} = +10600$$

$$\log \bar{z} = 0.02531$$

$$\log \bar{z} = 999918$$

$$\log \bar{z} = 8.50724$$

$$\log (X - A) = 1.51889$$

$$X - A = +3303$$

$$\eta = +0.6887$$

$$\eta_1 = +1$$

$$\eta_0 = +0.6886$$

$$\log \eta_0 = 9.83797$$

$$7.33115$$

$$\log (\bar{z} - B) = 2.50682$$

$$B - D = +5212$$

$$\log \Delta S = +0.2$$

$$\text{Correct } \Delta d = 0$$

1309 Conditional equation

Residuals

C

O - C

0.00 - 2.07 = + 9.4	- 0 + 32 + 8 = + 40	+ 5.4
- 0.09 - 2.07 = + 1.57	+ 0 + 32 + 8 = + 40	+ 11.7
- 1.09 - 1.77 = + 9.7	+ 3 + 28 + 8 = + 39	+ 5.8
- 1.68 - 1.21 = - 8.4	+ 4 + 19 + 8 = + 31	- 11.5
- 2.06 - 0.21 = - 2.4	+ 5 + 3 + 8 = + 16	- 4.0
- 1.92 + 0.79 = - 9.2	+ 5 - 12 + 8 = + 1	- 9.3
- 1.09 + 1.77 = + 4.3	+ 3 - 28 + 8 = - 17	+ 6.0
- 0.09 + 2.07 = + 2.1	+ 0 - 32 + 8 = - 24	+ 4.5
+ 0.91 + 1.87 = + 7.0	- 2 - 29 + 8 = - 23	+ 9.3
+ 1.92 + 0.79 = - 2.5	- 5 - 12 + 8 = - 9	- 1.6
+ 2.06 - 0.21 = - 1.48	- 5 + 3 + 8 = + 6	- 1.54
+ 1.91 - 0.80 = + 1.1	- 5 + 12 + 8 = + 15	- 4
+ 1.68 - 1.21 = - 2.3	- 4 + 19 + 8 = + 23	- 4.6
+ 0.91 - 1.86 = + 7.4	- 2 + 29 + 8 = + 35	+ 3.9
+ 1.37 - 4.12 = + 1.71		+ 4.66 - 4.68
		Average = 6.7

Formation of Normals

ab

ac

bc

1	- 0.00	+ 0.0	- 194.5
2	+ 0.19	- 14.1	- 325.2
3	+ 1.93	- 105.8	- 171.8
4	+ 2.03	+ 141.0	+ 101.7
5	+ 0.43	+ 49.5	+ 5.0
6	- 1.52	+ 176.8	- 72.7
7	- 1.93	- 46.9	+ 76.1
8	- 0.19	- 1.9	+ 43.5
9	+ 1.70	+ 63.7	+ 130.8
10	+ 1.52	- 48.0	- 19.7
11	- 0.43	- 304.8	+ 31.1
12	- 1.53	+ 21.0	- 8.8
13	- 2.03	- 38.6	+ 27.9
14	- 1.70	+ 67.4	- 137.6
	- 1.53	- 40.7	- 514.2

- 369.

1309

$\lambda = -4.48 \quad \beta = +2.56$

$c = -23$

	P	$P-C$	$\lambda \sin(P-C)$	$\beta \cos(P-C)$	19	H	$H \sin(P-C)$	0	$0-C$
1	180°	203°	+ 1.8	- 2.4	+4.5	-0.3	-28	+66"	+ 94
2	183	206	+ 2.0	- 2.3	+4.6	-0.2	-18	+139	+ 157
3	214	237	+ 3.8	- 1.4	+5.5	-0.3	-28	+69	+ 97
4	234	257	+ 4.4	- 0.6	+5.3	+0.3	+28	-56	- 84
5	264	287	+ 4.3	+ 0.8	+3.8	-0.6	-55	-79	- 24
6	292	315	+ 3.2	+ 1.8	+1.7	+1.4	+129	+37	- 92
7	328	351	+ 0.7	+ 2.5	-1.5	-0.4	-37	+6	+ 43
8	357	20	- 1.5	+ 2.4	-3.6	0.0	0	+21	+ 21
9	26	49	- 3.4	+ 1.7	-4.8	+0.6	+55	+125	+ 70
10	68	91	- 4.5	- 0.0	-4.2	+0.8	+74	+49	- 25
11	96	119	- 3.9	- 1.2	-2.4	+0.2	+18	-130	- 148
12	113	136	- 3.1	- 1.6	-1.0	-0.6	-55	-44	- 11
13	126	149	- 2.3	- 2.2	+0.2	+0.5	+46	+23	- 23
14	154	177	- 0.2	- 2.6	+2.7	-0.6	-55	+19	+ 74

- Normals -

$+ 29.23 - 1.53 + 1.39 = - 41$

$- 1.53 + 31.00 - 4.12 = - 514$

$+ 1.39 - 4.12 + 14.00 = + 171$

$+ 1.53 - 0.08 + 0.07 = - 2$

$- 1.39 + 0.07 - 0.07 = + 2$

$+ 30.92 - 4.05 = - 5116$

$- 4.05 + 139.3 = + 173$

$+ 4.05 - 0.53 = - 68$

$+ 1340 = + 105$

$0 = + 7.8$

$- 1.18 + 4.05 = + 50$

$+ 29.74 = - 466$

$t = - 157$

$- 0.14 + 0.41 - 1.39 = - 17$

$+ 0.41 - 1.21 + 4.12 = + 50$

$+ 29.09 - 1.12 = - 58$

$- 1.12 + 29.79 = - 464$

$- 0.04 + 1.12 = - 17$

$+ 29.05 = - 75$

$a = - 26$

$+ 29.3 - + 28$

$\Delta \lambda = 2.06 \lambda = - 0.05 = - 0.10$

$$\begin{array}{r}
 1309 \\
 X_1 = 18.0862 \\
 \frac{1}{2}a = \quad -1 \\
 \hline
 18.0861
 \end{array}$$

$$\text{corr. to } \Delta\alpha = 0$$

$$\begin{array}{r}
 Y_0 = 22.2125 \\
 \frac{1}{2}b = \quad -4 \\
 \hline
 22.2117
 \end{array}$$

$$\text{Corrected for plate constant } \lambda = 23.2100$$

$$\begin{array}{r}
 R^2 = 43022 \\
 c = \quad +8 \\
 \hline
 43030
 \end{array}$$

$$\eta = +1.2100$$

$$\eta_1 = \quad +1$$

$$\eta_0 = +1.2099$$

$$\begin{array}{r}
 \log \eta_0 = 0.08275 \\
 7.33115
 \end{array}$$

$$(\delta - D) = 2.75160$$

$$\delta - D = \quad +9.244$$

$$\text{correction to } \Delta\delta = -0.3$$

Conditional Equations

	O	C	O-C
1	+ 0.28 - 2.05 + 1 = +44	+ 4 + 5 + 41 = +50	- 6
2	- 0.72 - 1.95 + 1 = +14.2	- 10 + 5 + 41 = +36	+ 10.6
3	- 0.90 - 1.86 + 1 = -67	- 13 + 5 + 41 = +33	- 100
4	- 1.72 - 1.16 + 1 = -26	- 24 + 3 + 41 = +20	- 46
5	- 1.88 - 0.86 + 1 = +69	- 26 + 2 + 41 = +17	+ 52
6	- 2.07 + 0.14 + 1 = -20	- 29 - 0 + 41 = +12	- 32
7	- 1.73 + 1.14 + 1 = +49	- 24 - 3 + 41 = +14	+ 35
8	- 0.72 + 1.94 + 1 = -15	- 10 - 5 + 41 = +26	- 41
9	+ 0.28 + 2.06 + 1 = +100	+ 34 - 5 + 41 = +40	+ 60
10	+ 1.28 + 1.63 + 1 = +56	+ 18 - 4 + 41 = +55	+ 1
11	+ 1.73 + 1.14 + 1 = +8	+ 24 - 3 + 41 = +62	- 54
12	+ 2.06 + 0.14 + 1 = +54	+ 29 - 0 + 41 = +70	- 16
13	+ 1.88 - 0.86 + 1 = +120	+ 26 + 2 + 41 = +69	+ 51
14	+ 1.28 - 1.63 + 1 = +49	+ 18 + 4 + 41 = +63	- 14
	+ 563	+ 305 - 209	
		Average: 44	

Formation of Normals

1	- 0.57	+ 12.3	- 90.2
2	+ 1.40	- 102.0	- 277.0
3	+ 1.67	+ 60.3	+ 124.5
4	+ 2.00	+ 44.7	+ 30.2
5	+ 1.62	- 129.8	- 59.4
6	- 0.29	+ 41.4	- 2.8
7	- 1.97	- 84.8	+ 55.8
8	- 1.40	+ 10.8	- 29.2
9	+ 0.57	+ 28.0	+ 206.0
10	+ 2.09	+ 71.8	+ 91.4
11	+ 1.97	+ 13.8	+ 9.1
12	+ 0.29	+ 111.0	+ 7.6
13	- 1.62	+ 225.8	- 103.2
14	- 2.09	+ 62.8	- 79.8
	+ 367	+ 366.1	- 117.0

	1310	$X = -4.47$	$\beta = +2.51$	$C = -23$					
	P	$P-C$	$\lambda \sin(p-c)$	$\beta \cos(p-c)$	D	$\Delta \mu \sin \cos$	O	$O-C$	
1	172 ⁰	195 ⁰	+1.2	-1.4	+39	+0.6	+55	+99 ⁰	+44
2	200	223	+3.0	-1.8	+5.1	-0.4	-37	+105	+142
3	205	228	+3.3	-1.7	+5.3	-0.3	-28	-95	-67
4	236	259	+4.4	-0.5	+5.2	-0.9	+83	+57	-26
5	245	268	+4.5	-0.1	+4.9	-1.9	-175	-106	+69
6	274	297	+4.0	+1.1	+3.2	+0.7	+64 ⁰	+44	-20
7	303	326	+2.5	+2.1	+0.7	-1.1	-101	-42	+49
8	340	3	-0.2	+2.5	-2.4	-0.3	+28	+13	-15
9	8	31	-2.3	+2.2	-4.2	0.0	0	+100	+100
10	38	61	-3.9	+1.2	-4.8	-0.2	-18	+38	+3-6
11	57	80	-4.4	+0.4	-4.5	+0.7	+64	+72	+8
12	86	109	-4.2	-0.8	-3.1	-2.5	-230	-176	+54
13	115	138	-3.0	-1.9	-0.8	-1.1	-101	+19	+120
14	142	165	-1.2	-2.4	+1.5	+20.1	+9	+58	+49

~~columns~~

$$\begin{aligned}
 &+ 2988 + 367 - 0.95 = +366 \\
 &+ 367 + 3026 - 218 = -117 \\
 &- 0.95 - 2.18 + 1400 = +563 \\
 &- 367 - 0.45 + 0.12 = -45 \\
 &+ 0.95 + 0.12 - 0.03 = +12
 \end{aligned}$$

$$+ 2981 - 206 = -162$$

$$- 206 + 13.97 = +575$$

$$+ 206 - 0.14 = -10$$

$$+ 13.83 = +565$$

$$C = +40.8$$

$$- 0.30 + 206 = +85$$

$$+ 29.51 = -77$$

$$b = -2.6$$

$$- 0.64 - 1.48 + 0.95 = +38$$

$$- 1.48 - 0.34 + 2.18 = +88$$

$$+ 29.24 + 2.19 = +404$$

$$+ 2.19 + 29.92 = -29$$

$$- 0.16 - 2.19 = -2$$

$$+ 29.08 = +402$$

$$a = +13.8$$

$$- 247 - 30 - + 5$$

$$+ 0.07$$

1310

$$X_0 = 17.7212$$

$$\frac{1}{2}a = +7$$

$$17.7219$$

$$Y_0 = 21.8626$$

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

$$21.8625$$

$$R^2 = 4.2957$$

$$C = +41$$

$$4.2998$$

Corrected for plate constants $X = 17.7146$ $Y = 21.8439$

$$\xi = -0.2854$$

$$\log \xi = 9.45545m$$

$$\log \delta = 9.99905$$

$$\log \text{const} = 8.50724$$

$$\log (\alpha - A) = 0.94916m$$

$$\eta = -0.1561$$

$$\log \eta = 9.19340m$$

$$\log \text{const} = 7.33115$$

$$\log (\delta - D) = 1.86225m$$

$$(\alpha - A) = -8.90$$

$$\delta - D = -112.8$$

$$\text{corr to } \Delta \alpha = +0.01$$

$$\text{corr to } \Delta \delta = 0.0$$

conditional Eq.

Residuals

	a	b	c	0		C	0-C
1	+0.26	-2.06	+1	= +29	+1 + 1.5 + 5.7 =	+7.3	-4.9
2	-0.74	-1.94	+1	= +6.1	+2 + 1.4 + 5.7 =	+6.9	-8
3	-1.13	-1.74	+1	= +1.9	+3 + 1.2 + 5.7 =	+6.6	+5.3
4	-1.74	-1.14	+1	= +2.8	+5 + 8 + 5.7 =	+6.0	-3.2
5	-1.93	-0.74	+1	= +6.3	+5 + 5 + 5.7 =	+5.7	+6
6	-2.06	+0.26	+1	= +1	+6 + 2 + 5.7 =	+4.9	-4.8
7	-1.74	+1.14	+1	= +1.9	+5 + 8 + 5.7 =	+4.4	+1.4
8	-1.64	+1.26	+1	= +2.3	+4 + 9 + 5.7 =	+4.4	-2.1
9	-0.74	+1.94	+1	= -7.2	+2 + 1.4 + 5.7 =	+4.1	-1.1
10	+0.26	+2.06	+1	= +4.4	+1 + 1.5 + 5.7 =	+4.3	+1
11	+1.26	+1.64	+1	= +4.9	+3 + 1.2 + 5.7 =	+4.8	+1
12	+1.65	+1.26	+1	= +1.0	+4 + 9 + 5.7 =	+5.2	+6.8
13	+2.05	+0.26	+1	= +8.2	+6 + 2 + 5.7 =	+6.1	+2.5
14	+1.94	-0.74	+1	= -2.0	+5 + 5 + 5.7 =	+6.7	-8.7
15	+1.26	-1.64	+1	= +1.0	+3 + 1.2 + 5.7 =	+7.2	-2.2
16	+1.13	-1.74	+1	= +1.62	+3 + 1.2 + 5.7 =	+7.2	+9.0
	-1.91	-1.92		+9.24			-3.80 + 3.86

Hodge = 4.8

Formation of Normal

1	-0.54	+	6.3	-	49.4
2	+1.44	-	45.2	-	118.2
3	+1.97	-	134.5	-	207.0
4	+1.79	-	48.8	-	31.9
5	+1.43	-	121.5	-	46.5
6	-0.54	-	2.1	+	0.3
7	-1.99	-	330.8	+	216.2
8	-2.06	-	38.7	+	29.0
9	-1.44	+	53.3	-	139.8
10	+0.54	+	11.4	+	90.5
11	+2.06	+	61.8	+	80.4
12	+2.06	+	198.0	+	151.1
13	+0.54	+	168.5	+	21.3
14	-1.43	-	38.8	+	14.8
15	-2.06	+	63.0	-	82.1
16	-1.97	+	183.0	-	281.8
	0.00	-	15.1	-	353.1

<u>1311</u>	$\lambda = -4.46$	$\beta = +2.49$	$\gamma = -2.3$				
P	P-C	$\lambda \sin(P-C)$	$\beta \cos(P-C)$	0	Harpis Curve	0	0-C
1	173°	196° + 1.2	- 2.4	+39	-0.2 -18	+ 6	+24
2	201	224 + 3.1	- 1.8	+52	-0.5 -46	+15	+61
3	213	236 + 3.7	- 1.4	+54	-0.4 -37	+82	+119
4	237	260 + 4.4	- 0.4	+51	+1.2 +110	+138	+28
5	249	272 + 4.4	+ 0.1	+46	-1.5 -138	-75	+63
6	277	300 + 3.9	+ 1.2	+30	+0.3 +28	+29	+1
7	303	326 + 2.5	+ 2.1	+0.7	-1.0 -92	+98	+190
8	307	330 + 2.2	+ 2.2	+0.3	-1.9 -175	-152	+23
9	339	2 - 0.2	+ 2.5	-24	+0.4 +37	-35	-72
10	7	30 - 2.2	+ 2.2	-4.1	+0.2 +18	+62	+44
11	37	60 - 3.9	+ 1.2	-4.8	-0.4 -37	+12	+49
12	53	76 - 4.3	+ 0.6	-4.6	+0.3 +28	+148	+120
13	83	106 - 4.2	- 0.7	-3.2	-2.1 -193	-111	+82
14	111	134 - 3.2	- 1.7	-1.2	+0.3 +28	+8	-20
15	142	165 - 1.2	- 2.4	+1.5	+0.1 +9	+59	+50
16	147	170 - 0.8	- 2.5	+2.0	-1.4 -129	+33	+162

working Equations

$$\begin{aligned}
 + 34.84 - 0.00 - 1.91 &= - 1.5 \\
 - 0.00 + 34.43 - 1.92 &= - 3.53 \\
 - 1.91 - 1.92 + 16.00 &= + 9.24
 \end{aligned}$$

$$\begin{aligned}
 + 0.00 - 0.00 - 0.00 &= 0 \\
 + 1.91 - 0.00 - 0.09 &= - 1 \\
 + 34.43 - 1.92 &= - 3.53 \\
 - 1.92 + 15.91 &= + 9.23 \\
 + 1.92 - 0.11 &= + 20 \\
 + 15.80 &= + 9.03 \\
 - 0.23 + 1.92 &= + 1.11 \\
 + 34.20 &= - 2.42
 \end{aligned}$$

$$C = + 57.3'$$

$$A = + 7.1'$$

$$\begin{aligned}
 - 0.23 - 0.23 + 1.91 &= + 1.10 \\
 - 0.23 - 0.23 + 1.92 &= + 1.11
 \end{aligned}$$

$$\begin{aligned}
 + 34.11 - 0.23 &= + 9.5 \\
 - 0.23 + 34.20 &= - 2.42
 \end{aligned}$$

$$\begin{aligned}
 - 0.00 + 0.23 &= - 2 \\
 + 34.11 &= + 9.3
 \end{aligned}$$

$$a = + 2.7'$$

1311

$$X_0 = 17.7354$$

$$Y_0 = 21.7397$$

$$R^2 = 42986$$

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

$$\frac{1}{2}b = \quad - \quad 4$$

$$c = \quad + \quad 57$$

$$17.7355$$

$$21.7393$$

$$43043$$

corrected for data constants $X = 18.3865$ $Y = 22.3854$

$$\bar{z} = +0.3865$$

$$\eta = +0.3854$$

$$\log \bar{z} = 9.58715$$

$$\log \eta = 9.58591$$

$$\text{"was } \delta = 9.99902$$

$$7.33111$$

$$\text{"const} = 8.50724$$

$$\text{"(d-D)} = 2.25476$$

$$\text{"(A-A)} = 1.08089$$

$$\alpha - A = \quad + \quad 1205$$

$$\delta - D = \quad + \quad 259.8$$

$$\text{Corr to } \Delta \alpha = \quad + 0.01$$

$$\text{Corr to } \Delta \delta = \quad + 0.1$$

Conditional Eq

	a	b	c
1	+ 0.15	- 2.07	+ 1.2 + 73
2	- 0.85	- 1.89	+ 1.2 + 35
3	- 1.85	- 0.92	+ 1.2 + 70
4	- 2.07	+ 0.15	+ 1.2 = - 154
5	- 1.85	+ 0.92	+ 1.2 = - 40
6	- 1.73	+ 1.15	+ 1.2 = + 109
7	- 0.85	+ 1.89	+ 1.2 = - 33
8	+ 0.15	+ 2.07	+ 1.2 = - 18
9	+ 1.15	+ 1.73	+ 1.2 = + 108
10	+ 1.73	+ 1.15	+ 1.2 = + 24
11	+ 2.06	+ 0.15	+ 1.2 = + 73
12	+ 1.89	- 0.85	+ 1.2 = + 151
13	+ 1.15	- 1.73	+ 1.2 = + 245
	- 0.92	+ 1.75	+ 643

	C	0:-C
1	+ 5 + 53 + 56 = + 114	- 41
2	- 28 + 98 + 56 = + 76	- 41
3	- 62 + 24 + 56 = + 18	+ 52
4	- 69 - 4 + 56 = - 17	- 137
5	- 62 - 24 + 56 = - 30	- 10
6	- 58 - 30 + 56 = - 32	+ 141
7	- 28 - 48 + 56 = - 20	- 13
8	+ 5 - 53 + 56 = + 8	- 26
9	+ 39 - 44 + 56 = + 51	+ 57
10	+ 58 - 30 + 56 = + 84	- 60
11	+ 69 - 4 + 56 = + 121	- 48
12	+ 63 + 22 + 56 = + 141	+ 10
13	+ 39 + 44 + 56 = + 139	+ 106

+ 366 - 376

Average = 57

Formation of normals.

	ab	a	bn
1	- 0.31	+ 10.9	- 151.0
2	+ 1.61	- 29.8	- 66.2
3	+ 1.70	- 129.5	- 64.4
4	- 0.31	+ 318.5	- 23.1
5	- 1.70	+ 74.0	- 36.8
6	- 1.99	- 186.8	+ 125.2
7	- 1.61	+ 28.0	- 62.4
8	+ 0.31	- 27	- 37.2
9	+ 1.99	+ 124.2	+ 187.0
10	+ 1.99	+ 41.5	+ 27.6
11	+ 0.31	+ 150.5	+ 10.9
12	- 1.61	+ 285.0	- 128.2
13	- 1.99	+ 281.6	- 424.0
	- 1.61	+ 963.4	- 642.6

	λ	β	C						
	P	$p-c$	$\lambda \sin(p-c)$	$\beta \cos(p-c)$	$19.$	Hayn's Corr.	$\odot$	$0 - c$	
1	176°	199	+ 1.5	- 2.3	+ 4.1	+ 0.2 + 1.8	+ 91"	+ 73	
2	204	227	+ 3.3	- 1.7	+ 5.3	- 0.3 - 2.8	+ 7	+ 35	
3	244	267	+ 4.4	- 0.1	+ 4.8	- 1.8 - 16.6	- 96	+ 70	
4	274	297	+ 3.9	+ 1.1	+ 3.1	+ 0.7 + 6.4	- 90	- 154	
5	296	319	+ 2.9	+ 1.9	+ 1.3	- 0.2 - 1.8	- 58	- 40	
6	304	327	+ 2.4	+ 2.1	+ 0.6	- 1.2 - 11.0	- 1	+ 109	
7	336	359	+ 0.1	+ 2.5	- 2.1	0.0 0	- 33	- 33	
8	4	27	- 2.0	+ 2.2	- 3.9	+ 0.1 + 9	- 9	- 18	
9	34	57	- 3.7	+ 1.3	- 4.7	- 0.4 - 3.7	+ 71	+ 108	
10	56	79	- 4.4	+ 0.5	- 4.6	+ 0.6 + 5.5	+ 79	+ 24	
11	86	109	- 4.2	- 0.8	- 3.1	- 2.5 - 23.0	- 157	+ 73	
12	114	137	- 3.0	- 1.8	- 0.9	- 1.0 - 9.2	+ 89	+ 151	
13	146	169	- 0.9	- 2.4	+ 1.8	- 1.2 - 11.0	+ 131	+ 245	

Normal Equations

$$\begin{aligned}
 + 29.08 - 1.61 - 0.92 &= + 963 \\
 - 1.61 + 26.76 + 1.75 &= - 643 \\
 - 0.92 + 1.75 + 13.60 &= + 643
 \end{aligned}$$

$$\begin{aligned}
 + 1.61 - 0.09 - 0.05 &= + 53 \\
 + 0.92 - 0.05 - 0.03 &= + 30
 \end{aligned}$$

$$\begin{aligned}
 + 26.67 + 1.70 &= - 590 \\
 + 1.70 + 12.97 &= + 673
 \end{aligned}$$

$$\begin{aligned}
 - 1.70 - 0.11 &= + 38 \\
 + 12.86 &= + 711
 \end{aligned}$$

$$C = + 56.1$$

$$- 0.22 - 1.70 = - 88$$

$$+ 26.45 = - 678 \quad b = - 25.6$$

$$\begin{aligned}
 - 0.06 + 10.12 + 0.92 &= + 46 \\
 + 0.12 - 0.24 - 1.75 &= - 88
 \end{aligned}$$

$$\begin{aligned}
 + 29.02 - 1.49 &= + 1009 \\
 - 1.49 + 26.52 &= - 731
 \end{aligned}$$

$$\begin{aligned}
 - 0.08 + 1.49 &= - 41 \\
 + 28.94 &= + 968
 \end{aligned}$$

$$a = + 33.5$$

$$+ 464 - 26.76 - 1.5$$

$$\Delta \lambda = + 0.07$$

1312

$$\begin{array}{rcl}
 X_0 = 17.8540 & Y_0 = 21.8546 & R^2 = 4.2960 \\
 \frac{1}{2}A = \quad + 17 & \frac{1}{2}B = \quad - 13 & C = + \quad 56 \\
 \hline
 17.8557 & 21.8533 & 4.3016
 \end{array}$$

Corrected for plate constant $X = 19.0410$ $Y = 22.8998$

$$\begin{aligned}
 \bar{z} &= +1.0410 \\
 \log s &= 0.01745 \\
 \log s &= 9.99898 \\
 \log s &= 8.50724
 \end{aligned}$$

$$(x-A) = 1.51123$$

$$x-A = + 32.45$$

$$\text{Correction to } \Delta x = +0.02$$

$$\begin{aligned}
 y &= +0.8998 \\
 y_1 &= +1 \\
 y_0 &= +0.8997
 \end{aligned}$$

$$\begin{aligned}
 \log y_0 &= 9.95410 \\
 &= 7.53115 \\
 (A-D) &= 2.62295
 \end{aligned}$$

$$S-D = + 6.597$$

$$\text{Aver. to } \Delta t = - 0.4$$

Conditional Eq.

O

Residuals

C

O-C

1	$-1.73 + 1.13 + 1 = +1.24$	$+42 + 11 + 68 = +121$	$+3$
2	$-1.62 + 1.29 + 1 = +1$	$+40 + 12 + 68 = +120$	-119
3	$-0.62 + 1.98 + 1 = +1.52$	$+15 + 19 + 68 = +102$	$+50$
4	$+0.00 + 2.07 + 1 = +1.52$	$-0 + 20 + 68 = +88$	$+64$
5	$+0.38 + 2.04 + 1 = +1.91$	$-9 + 20 + 68 = +79$	$+12$
6	$+1.38 + 1.54 + 1 = +1.46$	$-34 + 15 + 68 = +49$	$+97$
7	$+1.73 + 1.13 + 1 = +1.1$	$-42 + 11 + 68 = +37$	-26
8	$+2.06 + 0.13 + 1 = -46$	$-51 + 1 + 68 = +18$	-64
9	$+2.06 + 0.00 + 1 = -164$	$-51 + 0 + 68 = +17$	-181
10	$+1.88 - 0.87 + 1 = +70$	$-46 - 8 + 68 = +14$	$+56$
11	$+1.38 - 1.54 + 1 = +1.29$	$-34 - 15 + 68 = +19$	$+110$
	$+6.90 + 8.90 = +666$		$+392 - 390$
			Average = 71

Formation of Wumab.

1	-1.95	-214.5	$+140.0$
2	-2.09	-1.6	$+1.3$
3	-1.28	-94.3	$+301.0$
4	$+0.00$	$+0.0$	$+314.5$
5	$+0.78$	$+34.6$	$+185.8$
6	$+2.13$	$+201.5$	$+225.0$
7	$+1.95$	$+19.0$	$+12.4$
8	$+0.27$	-94.7	-6.0
9	$+0.00$	-338.0	-0.0
10	-1.64	$+131.5$	-60.8
11	-2.13	$+178.0$	-198.8
	-3.91	-178.5	$+914.4$

1313-

p	
1	303
2	308
3	343
4	0
5	12
6	38
7	57
8	86
9	90
10	115
11	138

2	0
+	25
-	3.9
+	6.9
+	3.9
-	6.9

+	1
-	3.6
+	6.6
+	20.0
+	6.6
+	4.1
+	0.6
+	4.5
+	0.6
+	3.9
+	8.9
+	0.1
+	1.5
+	3.5
+	4.1
+	2.2
+	7.3
+	2.1
+	5.7
+	1.1

$$a = -11.1$$

$$\Delta x = 0.66$$

+	1
+	0.6
+	4.5
+	0.6
+	3.9
+	8.9
+	0.1
+	1.5
+	3.5
+	4.1
+	2.2
+	7.3
+	2.1
+	5.7
+	1.1

$$b = +5.3$$

$$c = +8.4$$

$$\Delta x = 1.09$$

-1313- reflecting (9)

+	2
+	0.7
+	3.9
+	4.1
+	8.9
+	0.1
+	1.5
+	3.5
+	4.1
+	2.2
+	7.3
+	2.1
+	5.7
+	1.1

7.6

8.2

9.6

10.72

4

$$\begin{array}{r} -119 \\ +50 \\ +64 \\ +12 \\ +97 \\ -26 \\ -64 \\ 781 \\ +56 \\ \hline 110 \\ 2-390 \\ 2-71 \end{array}$$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	1																																																																																								

Normal Equations

$$\begin{array}{r} + 25.01 - 3.91 + 6.90 = -17.8 \\ - 3.91 + 2.15 + 8.90 = +9.14 \\ + 4.90 + 8.90 + 1.00 = +6.66 \\ + 3.91 - 0.61 + 10.8 = +28 \\ - 6.90 + 10.8 - 1.90 = +49 \end{array}$$

$$\begin{aligned} &+ 2154 + 1001 + 886 \\ &+ 1001 + 910 = 715 \\ &- 1001 = 465 = 412 \\ &+ 445 = 303 \end{aligned} \quad \begin{aligned} \Delta \bar{H} &= -0.96 \\ \Delta \bar{S} &= 68.2 \end{aligned}$$

$$\begin{array}{r} -1100-1001=-785 \\ +1054=+101 \end{array} \quad \begin{array}{r} 1-+96 \\ -069+391+157+161 \\ +157-390-358=-367 \end{array}$$

$$\begin{array}{rcl} + 2.432 & + & 8.47 = -17 \\ + 8.47 & + & 7.42 = +29.9 \\ - 9.67 & - & 8.47 = +34.1 \\ + 14.65 & & = -35.8 \end{array} \quad \begin{array}{l} \Delta \theta = -0.72 \\ q = -29.4 \end{array}$$

1313

$$X_0 = 17.6150$$

$$\frac{1}{2}a = \frac{-12}{17.6138}$$

$$17.6138$$

$$Y_0 = 21.8260$$

$$\frac{1}{2}b = \frac{+5}{21.8265}$$

$$21.8265$$

$$R^2 = 4.2885$$

$$+68$$

$$4.2953$$

Corrected for plate constants $X = 15.7261$ $Y = 24.8265$

$$\bar{z} = -22739$$

$$\log \bar{z} = 0.35677$$

$$\log s = 9.99889$$

$$8.50724$$

$$\eta = +28265$$

$$\eta_1 = +4$$

$$\eta_0 = +28261$$

$$\log \eta_0 = 0.45119$$

$$7.33115$$

$$(H - H) = 1.85064$$

$$\alpha - A = -110.90$$

$$(S - D) = 312004$$

$$A = 0 - 5806$$

$$S - D = +21584$$

$$\alpha = 0565510$$

$$\text{Corr. to } \Delta S = -1.1$$

$$\text{Red. ad l. app.} + 3.01$$

$$\alpha' = 05658.11$$

$$\text{Linear parallax} + 135.27$$

$$\alpha = 05833.38$$

$$\text{Ant. Allen } 005832.97$$

$$O - C + 0.41$$

Conditional Equations.

(75)

	O	C	O - C
1	-1.54 + 1.38 + 1 = +45	-10 - 1 - 10 = -21	+66
2	-1.30 + 1.61 + 1 = -109	-8 - 2 - 10 = -20	-89
3	-0.30 + 2.04 + 1 = +79	-2 - 2 - 10 = -14	+93
4	+0.00 + 2.06 + 1 = -56	+0 - 2 - 10 = -12	-44
5	+0.70 + 1.94 + 1 = -38	+4 - 2 - 10 = -8	-30
6	+1.54 + 1.38 + 1 = -74	+10 - 1 - 10 = -1	-73
7	+1.70 + 1.18 + 1 = +85	+11 - 1 - 10 = 0	+85
8	+2.03 + 0.38 + 1 = +22	+13 - 0 - 10 = +3	+19
9	+2.06 + 0.00 + 1 = -102	+13 - 0 - 10 = +3	-105
10	+1.98 - 0.62 + 1 = +127	+13 + 1 - 10 = +4	+123
11	+1.70 - 1.18 + 1 = -8	+11 + 1 - 10 = +2	-10
12	+1.29 - 1.62 + 1 = -41	+8 + 2 - 10 = 0	-41
	+9.86 + 8.55 = -70		+386 - 397
			Averages 65

Formation of Wounds.

1	-2.12 - 69.4	+ 62.0
2	-2.09 + 141.8	- 175.5
3	-0.61 - 23.7	+ 161.2
4	+0.00 - 0.0	- 115.2
5	+1.36 - 26.6	- 73.8
6	+2.12 - 114.0	+ 102.1
7	+2.01 + 144.5	+ 100.2
8	+0.77 + 44.7	+ 8.4
9	+0.00 - 210.0	- 0.0
10	-1.23 + 251.5	- 78.7
11	-2.01 - 13.6	+ 9.4
12	-2.09 - 52.9	+ 66.4
	-389 + 723	- 137.7

$$1314 \quad \lambda = -4.43 \quad \beta = +2.40 \quad \alpha = -23^\circ$$

	P	P-C	$\lambda_{\text{calc}}(P-C)$	$\beta_{\text{calc}}(P-C)$	α	Hampshire	Corr.	α	$\alpha-C$
1	312	335	+1.9	+2.2	-0.1	0.0	0	+45	+45
2	321	344	+1.2	+2.3	-0.8	-0.1	-9	-118	-109
3	352	15	-1.1	+2.3	-3.1	+0.2	+18	+97	+79
4	0	23	-1.7	+2.2	-3.6	-0.2	-18	-74	-56
5	20	43	-3.0	+1.8	-4.5	+0.1	+1	-37	-38
6	48	71	-4.2	+0.6	-4.7	+0.4	+37	-37	-74
7	55	78	-4.3	+0.5	-4.5	+0.4	+37	+122	+85
8	79	102	-4.3	-0.5	-3.5	-0.2	-18	+4	+22
9	90	113	-3.8	-0.9	-2.6	-1.8	-165	-268	-102
10	107	130	-3.4	-1.5	-1.6	+0.6	+55	+182	+127
11	125	148	-1.7	-2.0	+0.6	+0.1	+9	+1	-8
12	137	160	-1.5	-2.3	+1.1	+0.8	+74	+33	-41

Normal Equations

$$\begin{aligned} + 26.74 - 3.89 + 9.86 &= + 72 \\ - 3.89 + 24.54 + 8.55 &= - 138 \\ + 9.86 + 8.55 + 12.00 &= - 70 \end{aligned}$$

$$\begin{aligned} + 3.89 - 0.57 + 1.44 &= + 10 \\ - 9.86 + 1.44 - 3.64 &= - 27 \end{aligned}$$

$$+ 2397 + 999 = - 128$$

$$+ 999 + 836 = - 97$$

$$- 999 - 416 = + 53$$

$$+ 4.20 = - 44$$

$$C = - 10.5$$

$$- 1192 - 999 = + 116$$

$$+ 1205 = - 12$$

$$A = - 10$$

$$- 8.11 - 703 - 986 = + 58$$

$$- 703 - 610 - 855 = + 50$$

$$+ 18.63 - 1092 = + 130$$

$$- 1092 + 1844 = - 88$$

$$- 648 + 1092 = - 52$$

$$+ 12.15 = + 78$$

$$a = + 6.4$$

See over 4 pages

$$1314 =$$

$$\begin{array}{r} X_0 = 162995 \\ \frac{1}{2}a = \quad +31 \\ \hline 163026 \end{array}$$

$$\begin{array}{r} Y_0 = 216220 \\ \frac{1}{2}b = \quad -29 \\ \hline 216191 \end{array}$$

$$\begin{array}{r} R^2 = 42764 \\ c = \quad -19 \\ \hline 42745 \end{array}$$

From plate constants $X = 163868$ $Y = 253400$

$$\begin{array}{r} \bar{x} = -1.6132 \\ \log \bar{x} = 0.20768 m \\ \text{ms} = 999885 \\ \quad 850724 \end{array}$$

$$x - A = 1.70159 m$$

$$x - A = -50.30$$

$$\text{Corr } \Delta x = +0.07$$

$$\begin{array}{r} \eta = +33490 \\ \eta_1 = \quad +2 \\ \eta_0 = +33098 \\ \log \eta_0 = 0.51980 \\ \quad 733115 \\ \eta(t-D) = 3.18865 \end{array}$$

$$s - D = +25440$$

$$\text{Corr } \Delta s = -00$$

Conditional Eqs

	a	b	c	d
1	-1.52	+1.40	+12	-41
2	-1.38	+1.54	+11	-97
3	-0.38	+2.03	+12	-17
4	+0.00	+2.07	+12	-71
5	+0.62	+1.98	+12	+26
6	+1.12	+1.40	+12	+64
7	+1.62	+1.29	+12	-10
8	+2.03	+0.40	+12	+26
9	+2.06	+0.00	+12	-115
10	+1.98	-0.66	+11	+67
11	+1.62	-1.29	+12	-37
12	+1.31	-1.60	+12	+60

Residuals

	O-C
1	-30 -1 -27 = +17
2	-27 -1 -27 = -42
3	-7 -2 -27 = +19
4	+0 -2 -27 = -32
5	+12 -2 -27 = +43
6	+30 -1 -27 = +62
7	+32 -1 -27 = -14
8	+40 -0 -27 = +13
9	+41 -0 -27 = +129
10	+39 +1 -27 = +54
11	+32 +1 -27 = -43
12	+26 +2 -27 = +19

$$+267 - 260$$

$$\text{Average} = 44$$

$$\text{std} \dots = 72$$

Continuation of residuals

	aka	don
1	+ 62.4	- 57.5
2	+ 134.0	- 149.3
3	+ 6.4	- 34.5
4	- 0.0	- 147.0
5	+ 16.1	+ 51.5
6	+ 97.4	+ 89.5
7	- 16.2	- 12.9
8	+ 52.8	+ 10.4
9	- 137.0	0.0
10	+ 132.9	- 40.3
11	- 60.0	+ 47.8
12	+ 78.5	- 96.0
	+ 267.3	- 338.3

	λ	β	γ	δ	ϵ	ζ	η	θ	ι
1	313	336	+1.5	+2.2	-0.1	+0.4	+37	-4	-41
2	318	341	+1.4	+2.3	-0.6	+0.3	+28	-69	-97
3	349	12	-0.9	+2.4	-3.0	-0.6	-55	-72	-17
4	0	23	-1.7	+2.2	-3.6	-0.2	-18	-89	-71
5	17	40	-2.8	+1.8	-4.3	0.0	0	+26	+26
6	47	70	-4.1	+0.8	-4.6	+0.2	+18	+82	+64
7	51	74	-4.2	+0.7	-4.6	+0.8	+74	+64	-10
8	78	101	-4.3	-0.5	-3.5	-0.2	-18	+8	+26
9	90	113	-4.1	-0.9	-2.9	-1.9	-175	-290	-115
10	107	130	-3.4	-1.5	-1.6	+0.6	+55	+122	+67
11	128	151	-2.1	-2.1	+0.3	+1.5	+138	+101	-37
12	141	164	-1.2	-2.3	+1.4	-0.9	-83	-23	+60

Normal Equations

$$\begin{aligned}
 +26.33 - 4.16 + 9.48 &= +26.7 \\
 - 4.16 + 25.02 + 8.62 &= -3.38 \\
 + 9.48 + 8.62 + 12.00 &= -14.5 \\
 + 4.16 - 0.66 + 1.50 &= +4.2 \\
 - 9.48 + 1.50 - 3.42 &= -9.6
 \end{aligned}$$

$$\begin{aligned}
 +24.36 + 10.12 &= -29.6 \\
 +10.12 + 8.58 &= -24.1
 \end{aligned}$$

$$\frac{\Delta y}{\Delta z} = -0.86$$

$$\begin{aligned}
 -10.12 - 4.20 &= +12.3 \\
 + 4.38 &= -11.8
 \end{aligned}$$

$$c = -26.9$$

$$\begin{aligned}
 -11.92 - 10.12 &= +28.4 \\
 +12.44 &= -12
 \end{aligned}$$

$$b = -1.0$$

$$\begin{aligned}
 -0.69 + 4.16 + 1.43 &= -5.7 \\
 + 1.43 - 8.62 - 2.97 &= +11.6
 \end{aligned}$$

$$\begin{aligned}
 +25.64 - 10.97 + 10.91 &= +21.0 \\
 +10.91 - 13.87 + 9.03 &= -2.9
 \end{aligned}$$

$$\frac{\Delta x}{\Delta z} = -0.88$$

$$-13.20 + 10.97 - 10.91 = +3.5$$

$$+12.44$$

$$= +24.5$$

$$a = +19.7$$

1315-

$$X_0 = 16.3830$$

$$+ 10$$

$$16.3840$$

$$Y_0 = 21.5990$$

$$- 0$$

$$21.5990$$

$$P^2 = 4281.8$$

$$C = -27$$

$$4279.1$$

$$\text{From plate constants } \chi = 17.0323$$

$$Y = 25.7746$$

$$\bar{z} = -0.9677$$

$$\log = 9.98574$$

$$\text{was} = 9.99881$$

$$8.50724$$

$$\text{corr. to } \Delta\delta = 0$$

$$(x - A) = 147969$$

$$x - A = -30.18$$

$$\text{corr. to } \Delta\delta = -0.02$$

Conditional Eq.

			0
1	-1.54 + 1.38 + 1 =	-85	
2	-1.30 + 1.61 + 1 =	-361	
3	-0.30 + 2.04 + 1 =	-40	
4	+0.00 + 2.06 + 1 =	-165	
5	+0.70 + 1.94 + 1 =	-110	
6	+1.54 + 1.38 + 1 =	-78	
7	+1.70 + 1.18 + 1 =	+100	
8	+2.03 + 0.38 + 1 =	+98	
9	+2.06 + 0.00 + 1 =	-2	
10	+1.98 - 0.62 + 1 =	+262	
11	+1.70 - 1.18 + 1 =	+149	
12	+1.29 - 1.62 + 1 =	+126	
	+9.86 + 8.55	-106	

Results

	C	0 - C	
-97 - 80 - 19 =	-196	+111	1
-82 - 93 - 19 =	-194	-167	2
-19 - 118 - 19 =	-156	+116	3
+0 - 119 - 19 =	-138	-27	4
+44 - 112 - 19 =	-87	-23	5
+97 - 80 - 19 =	+3	-81	6
+107 - 68 - 19 =	+20	+80	7
+127 - 23 - 19 =	+85	+13	8
+129 - 0 - 19 =	+110	-112	9
+124 + 36 - 19 =	+141	+121	10
+107 + 68 - 19 =	+156	-7	11
+81 + 94 - 19 =	+156	-30	12

+441 - 447

Average = 74

Formation of normals

1	-2.12	+131.0	-117.4
2	-2.09	+469.0	-581.0
3	-0.61	+12.0	-81.6
4	+0.00	-0.0	-340.0
5	+1.36	-77.0	-213.5
6	+2.12	-120.1	-107.7
7	+2.01	+170.0	+118.0
8	+0.77	+199.0	+37.2
9	+0.00	-4.1	-0.0
10	-1.23	+519.0	-162.5
11	-2.01	+253.5	-175.8
12	-2.09	+162.5	-204.0
	-389	+1714.8	-1828.3

1314

0

Hayn

0 - c

- 85

0

- 85

- 370

- 9

- 361

- 22

+ 18

- 40

- 183

- 18

- 165

- 109

+ 1

- 110

- 41

+ 37

- 78

+ 137

+ 37

+ 100

+ 80

- 18

+ 98

- 168

- 166

- 2

+ 317

+ 55

+ 262

+ 118

+ 9

+ 149

+ 200

+ 74

+ 126

Normal Equation

a

b

c

$$+ 26.74 - 3.89 + 9.86 = + 17.5$$

$$- 3.89 + 24.54 + 8.55 = - 1.828$$

$$+ 9.86 + 8.55 + 12.00 = - 1.06$$

$$+ 3.89 - 0.57 + 1.43 = + 2.49$$

$$- 9.86 + 1.43 - 3.64 = - 6.32$$

$$+ 23.97 + 9.98 = - 15.79$$

$$+ 9.98 + 8.36 = - 7.38$$

$$- 9.98 - 4.16 = + 6.57$$

$$+ 4.20 = - 8.1$$

$$c = - 19.3$$

$$- 11.90 - 9.98 = + 8.82$$

$$+ 12.07 = - 6.97$$

$$b = - 57.8$$

$$- 8.11 - 7.03 - 9.86 = + 8.7$$

$$- 7.03 - 6.09 - 8.55 = + 7.5$$

$$+ 18.63 - 10.92 = + 18.02$$

$$- 10.92 + 18.45 = - 17.53$$

$$- 6.47 + 10.92 = - 10.38$$

$$+ 12.16 = + 7.64$$

$$a = + 62.8$$

$$+ 16.9 - 6.2 = - 0.76$$

11
10
9
8
7
6
5
4
3
2
1

Summary

Rate	corr to $\Delta\alpha$	$\Delta\delta$	O-C (average)		$\Delta\alpha$		$\Delta\delta$	
			new	old	new	old	new	old
1) 1301	-0.02	+0.2	53	28	+0.55	+0.57	+1.7	+1.4
2) 1302	+0.06	0.0	49	42	+0.50	+0.44	-0.2	-0.2
3) 1303	0.00	-0.1	38	84	+0.53	+0.53	+2.3	+2.4
4) 1304	0.00	+0.3	53	73	+0.50	+0.50	+3.4	+3.1
5) 1305	0.00	+0.2	59	62	+0.53	+0.53	+3.3	+3.1
6) 1307	0.00	+0.2	51	66	+0.53	+0.53	+2.4	+2.2
7) 1308	0.00	+0.2	56	65	+0.42	+0.42	+2.2	+2.0
8) 1309	0.00	-0.3	67	56	+0.55	+0.55	+2.1	+2.4
9) 1310	+0.01	0.0	44	66	+0.49	+0.48	+1.5	+1.5
10) 1311	+0.01	+0.1	48	57	+0.54	+0.53	+2.8	+2.7
11) 1312	+0.02	-0.4	57	50	+0.56	+0.54	+1.8	+2.2
12) 1313	-0.09	-0.8	71	101	+0.41	+0.49	+1.0	+2.1
13) 1314	+0.03	0.0	74	102	+0.60	+0.58	+3.2	+3.2
14) 1315	-0.02	0.0	44	72	+0.45	+0.47	+1.7	+1.7
			55	66				

These are not referred
to a standard radius.

$$Y_0 = 282055$$

$$\frac{1}{2}a = \begin{array}{r} + 45 \\ \hline 182100 \end{array}$$

$$Y_0 = 223546$$

$$\frac{1}{2}b = \begin{array}{r} + 8 \\ \hline 223554 \end{array}$$

From plate constant $X = 22.1258$

$Y = 24.9358$

$$S = +4.1258$$

$$\log S = 0.61551$$

$$\cos S = 9.99939$$

$$\begin{array}{r} - 8.50724 \\ \hline 2.10888 \end{array}$$

$$\alpha - A = + 2 \quad 0.850$$

correction to $\Delta\alpha = + 0.13$

$$\eta = +2.9358$$

$$\eta_1 = +10$$

$$\eta_0 = +2.9348$$

$$\log \eta_0 = 0.46758$$

$$\begin{array}{r} 7.33115 \\ \hline 3.13643 \end{array}$$

$S - D = + 22' 49.1$
corr to $\Delta S = + 0.7$

$$Y_0 = 182055$$

$$\frac{1}{2}a = \begin{array}{r} - 9 \\ \hline 182046 \end{array}$$

$$Y_0 = 223546$$

$$\frac{1}{2}b = \begin{array}{r} - 10 \\ \hline 223536 \end{array}$$

From plate constant $X = 22.1204$

$Y = 24.9340$

$$S = +4.1204$$

$$\log S = 0.61494$$

$$(\alpha - A) = 2.10831$$

$$\eta = +2.9340$$

$$\eta_1 = +10$$

$$\eta_0 = +2.9320$$

$$\log \eta_0 = 0.46731$$

$\alpha - A = + 2 \quad 0.832$
corr to $\Delta\alpha = - 0.05$

$(\alpha - A) = 3.13616$
 $(S - D) = + 22' 48.2$
corr to $\Delta S = - 0.2$

1304 - 1st half - L180-L354

Normal Equations

$$+ 19.30 - 0.52 - 11.74 = + 619$$

$$- 0.52 + 23.53 - 1.47 = + 191$$

$$- 11.74 - 1.47 + 10.00 = - 135$$

$$+ 0.52 - 0.01 - 0.32 = + 17$$

$$+ 11.74 - 0.32 - 7.14 = + 376$$

$$+ 23.52 - 1.79 = + 208$$

$$- 1.79 + 2.96 = + 241$$

$$+ 1.79 - 0.14 = + 16$$

$$+ 2.72 = + 257$$

$$- 1.12 + 1.79 = + 151$$

$$+ 22.40 = + 359$$

$$- 0.01 + 0.52 - 0.03 = + 4$$

$$- 0.03 + 1.47 - 0.09 = + 12$$

$$+ 19.29 - 11.77 = + 623$$

$$- 11.77 + 9.91 = - 123$$

$$- 13.95 + 11.77 = - 146$$

$$+ 5.84 = + 477$$

$$\frac{\Delta x}{\Delta a} = + 1.26$$

$$\frac{\Delta y}{\Delta a} = + 0.16$$

$$c = + 94.4$$

$$b = + 16.0$$

$$a = + 89.4$$

2d half L0 - L131 - Normal Equations

$$+ 23.38 + 2.02 + 13.26 = - 265$$

$$+ 2.02 + 15.13 + 4.58 = - 263$$

$$+ 13.26 + 4.58 + 9.00 = - 194$$

$$- 2.02 - 0.17 - 1.15 = + 23$$

$$- 13.26 - 1.15 - 7.53 = + 150$$

$$+ 14.96 + 3.43 = - 240$$

$$+ 3.43 + 1.47 = - 44$$

$$- 3.43 - 0.79 = + 55$$

$$+ 0.68 = + 11$$

$$= 8.01 - 3.43 = + 103$$

$$+ 6.95 = - 137$$

$$\frac{\Delta x}{\Delta a} = - 1.13$$

$$\frac{\Delta y}{\Delta a} = - 0.47$$

$$c = + 16.2$$

$$b = - 19.7$$

$$- 0.13 - 2.02 - 0.61 = + 35$$

$$- 0.61 - 4.58 - 1.39 = + 80$$

$$+ 23.25 + 12.65 = - 230$$

$$+ 12.65 + 7.61 = - 114$$

$$- 21.00 - 12.65 = + 189$$

$$+ 2.25 = - 41$$

$$a = - 18.2$$

$$\begin{array}{r}
 X_0 = 17.8974 \\
 + 41 \\
 \hline
 17.9015
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.3880 \\
 - 13 \\
 \hline
 22.3867
 \end{array}$$

From plate constant $\lambda = 15.7723$

Corr. to $\Delta\delta = 0.0$

$$\begin{array}{r}
 \xi = -2.2296 \\
 \log \xi = 0.34784 \\
 9.99934 \\
 \hline
 8.50724 \\
 1.84126
 \end{array}$$

$$(x-A) = -1.0938$$

Correction to $\Delta\alpha = +0.12$

$$\begin{array}{r}
 X_0 = 17.8974 \\
 - 27 \\
 \hline
 17.8947
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.3880 \\
 - 5 \\
 \hline
 22.3875
 \end{array}$$

From plate constant $\lambda = 15.7655$

$$Y_1 = 19.9402$$

$$\begin{array}{r}
 \xi = -2.2345 \\
 \log \xi = 0.34918
 \end{array}$$

$$\begin{array}{r}
 \eta = -2.0598 \\
 + 3 \\
 \hline
 \eta_1 = -2.0601
 \end{array}$$

$$(x-A) = 1.84260$$

$$\begin{array}{r}
 \log \eta_0 = 0.31389 \\
 7.33115 \\
 \hline
 2.98274
 \end{array}$$

$$x-A = -1.0960$$

Corr. to $\Delta\alpha = -0.10$

$$\delta-D = -16.010$$

Corr. to $\Delta\delta = +0.4$

1205 - First time L 177 - L 334

$$\begin{array}{rcl}
 + 25.20 - & 0.59 - & 14.42 = + 589 \\
 - 0.59 + & 17.68 - & 1.62 = - 700 \\
 - 14.42 - & 1.62 + & 10.00 = - 99
 \end{array}$$

$$\frac{\Delta x}{\Delta n} = +1.19$$

$$\begin{array}{rcl}
 + 0.59 - & 0.01 - & 0.34 = + 14 \\
 + 14.42 - & 0.34 - & 8.25 = + 337
 \end{array}$$

$$\frac{\Delta y}{\Delta n} = +0.23$$

$$\begin{array}{rcl}
 + 17.67 - & 19.6 = & - 686 \\
 - 1.96 + & 17.5 = & + 238
 \end{array}$$

$$\begin{array}{rcl}
 + 19.6 - & 0.22 = & - 76 \\
 & + 1.53 = & + 162
 \end{array}$$

$$c = +105.8$$

$$\begin{array}{rcl}
 - 2.20 + & 1.96 = & + 269 \\
 + 15.47 & & = - 417
 \end{array}$$

$$b = - 26.9$$

$$\begin{array}{rcl}
 - 0.02 + & 0.59 - & 0.05 = - 23 \\
 - 0.05 + & 1.62 - & 0.15 = - 64
 \end{array}$$

$$\begin{array}{rcl}
 + 25.18 & & - 14.47 = + 566 \\
 - 14.47 & & + 9.85 = - 163
 \end{array}$$

$$\begin{array}{rcl}
 - 21.20 & & + 14.47 = - 239 \\
 + 3.98 & & = + 327
 \end{array}$$

$$a = + 82.2$$

2d half L 0 - L 148

$$\begin{array}{rcl}
 + 18.81 + & 0.58 + & 11.21 = - 249 \\
 + 0.58 + & 19.75 + & 4.58 = + 91 \\
 + 11.21 + & 4.58 + & 9.00 = - 30
 \end{array}$$

$$\frac{\Delta x}{\Delta n} = -1.22$$

$$\begin{array}{rcl}
 - 0.58 - & 0.02 - & 0.35 = + 8 \\
 - 11.21 - & 0.35 - & 6.68 = + 148
 \end{array}$$

$$\frac{\Delta y}{\Delta n} = -0.21$$

$$\begin{array}{rcl}
 + 19.78 + & 4.23 = & + 99 \\
 + 4.23 + & 2.32 = & + 118
 \end{array}$$

$$\begin{array}{rcl}
 - 4.23 - & 0.93 = & - 21 \\
 & + 1.39 = & + 99
 \end{array}$$

$$c = + 69.8$$

$$\begin{array}{rcl}
 - 7.71 - & 4.23 = & - 215 \\
 + 12.02 & & = - 116
 \end{array}$$

$$b = - 96.5$$

$$\begin{array}{rcl}
 - 0.02 - & 0.58 - & 0.13 = - 3 \\
 - 0.13 - & 4.58 - & 1.06 = - 24
 \end{array}$$

$$\begin{array}{rcl}
 + 18.79 & & + 11.08 = - 252 \\
 + 11.08 & & + 7.94 = - 51
 \end{array}$$

$$\begin{array}{rcl}
 - 15.45 & & - 11.08 = + 71 \\
 + 3.34 & & = - 181
 \end{array}$$

$$a = - 54.2$$

1307

$$X_0 = 18.1834$$

$$\frac{1}{2}a = \frac{+43}{18.1877}$$

$$Y_0 = 21.6060$$

$$\frac{1}{2}b = \frac{-4}{21.6056}$$

$$\text{Transit constant } X = 18.4679 \quad Y = 22.1877$$

$$z = +0.4679$$

$$\begin{aligned} \log z &= 9.67015 \\ &9.99921 \\ &8.50724 \\ &1.16370 \end{aligned}$$

$$\eta = +0.1877$$

$$\begin{aligned} \log \eta &= 9.27346 \\ &7.33115 \\ &1.94231 \end{aligned}$$

$$(X-A) = +14.58$$

$$\text{corr. to } \Delta X = +0.10$$

$$(S-D) = +127.6$$

$$\text{corr. to } \Delta S = +0.4$$

$$X_0 = 18.1834$$

$$\frac{1}{2}a = \frac{-16}{18.1818}$$

$$Y_0 = 21.6060$$

$$\frac{1}{2}b = \frac{-15}{21.6045}$$

$$\text{Transit constant } X = 18.4620 \quad Y = 22.1866$$

$$z = +0.4620$$

$$\eta = +0.1866$$

$$\log z = 9.66464$$

$$\begin{aligned} \log \eta &= 9.27091 \\ &7.33115 \\ &1.93976 \end{aligned}$$

$$(X-A) = 1.15819$$

$$X-A = +14.39$$

$$\text{corr. to } \Delta X = -0.09$$

$$S-D = +127.0$$

$$\text{corr. to } \Delta S = -0.2$$

1307- 1st half $\angle 180^\circ - \angle 35^\circ$

$$\begin{array}{rcl}
 + 19.31 + & 0.40 - & 11.64 = + 63.0 \\
 + 0.40 + & 23.67 - & 2.52 = - 35.8 \\
 - 11.64 - & 2.52 + & 10.00 = - 9.3
 \end{array}$$

$$\frac{\Delta x}{\Delta n} = + 1.25$$

$$\begin{array}{rcl}
 - 0.40 - & 0.01 + & 0.24 = - 1.3 \\
 + 11.64 + & 0.24 - & 7.00 = + 37.9
 \end{array}$$

$$\frac{\Delta y}{\Delta n} = + 0.20$$

$$+ 23.67 - 2.28 = - 37.1$$

$$- 2.28 + 3.00 = + 28.6$$

$$+ 2.28 - 0.22 = - 3.6$$

$$+ 2.78 = + 25.0$$

$$c = + 90.0^\circ$$

$$- 1.73 + 2.28 = + 21.7$$

$$+ 21.94 = - 15.4$$

$$t = - 7.0$$

$$\begin{array}{rcl}
 - 0.01 - & 0.40 + & 0.04 = + 6 \\
 + 0.04 + & 2.52 - & 0.27 = - 3.8
 \end{array}$$

$$+ 19.30 - 11.60 = + 63.6$$

$$- 11.60 + 9.73 = - 13.1$$

$$- 13.75 + 11.60 = - 15.6$$

$$+ 5.55 = + 48.0$$

$$a = + 86.5^\circ$$

2d half $\angle 0 - \angle 141$

$$+ 23.71 + 1.17 + 13.40 = + 47.2$$

$$+ 1.17 + 14.95 + 3.55 = - 15.2$$

$$+ 13.40 + 3.55 + 9.00 = + 31.5$$

$$\frac{\Delta x}{\Delta n} = - 1.15$$

$$- 1.17 - 0.06 = - 0.66$$

$$- 13.40 - 0.66 = - 7.60$$

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

$$+ 14.93 + 2.89 = - 17.5$$

$$+ 2.89 + 1.40 = + 4.7$$

$$- 2.89 - 0.56 = + 3.4$$

$$+ 0.84 = + 8.1$$

$$c = + 96.5^\circ$$

$$- 5.96 - 2.89 = - 9.7$$

$$+ 8.97 = - 27.2$$

$$t = - 30.3$$

$$- 0.09 - 1.17 = - 0.28$$

$$- 0.28 - 3.55 = - 0.84$$

$$+ 23.62 + 13.12 = + 48.4$$

$$+ 13.12 + 8.16 = + 35.1$$

$$- 21.10 - 13.12 = - 56.4$$

$$+ 2.52 = - 8.0$$

$$a = - 31.8^\circ$$

$$\begin{array}{r}
 120 \times \\
 X_0 = 17.3414 \\
 \Delta\alpha = \quad \quad + 21 \\
 \hline
 17.3435
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 21.8731 \\
 \Delta\delta = \quad \quad - 14 \\
 \hline
 21.8717
 \end{array}$$

Swingplate constant $X = 19.0610$ $Y = 22.6878$

$$\begin{array}{r}
 \xi = +1.0610 \\
 \log \xi = 0.02572 \\
 \log S = 9.99918 \\
 \hline
 8.50724 \\
 1.51930
 \end{array}$$

$$\begin{array}{r}
 \eta = +0.6878 \\
 \eta_1 = \quad \quad + 1 \\
 \eta_0 = +0.6877 \\
 \log \eta_1 = 9.83740 \\
 \hline
 7.33115 \\
 2.50625
 \end{array}$$

$$X - A = +33.06$$

$$S - D = +520.8$$

$$\text{Corr to } \Delta\alpha = +0.03$$

$$\text{Corr to } \Delta\delta = -0.2$$

$$\begin{array}{r}
 X_0 = 17.3414 \\
 \Delta\alpha = \quad \quad - 5 \\
 \hline
 17.3409
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 21.8731 \\
 \Delta\delta = \quad \quad + 6 \\
 \hline
 21.8737
 \end{array}$$

Swing Plate constant $X = 19.0584$ $Y = 22.6898$

$$\begin{array}{r}
 \xi = +1.0584 \\
 \log \xi = 0.02465 \\
 \log S = 9.99918 \\
 \hline
 8.50724 \\
 1.51823
 \end{array}$$

$$\begin{array}{r}
 \eta = +0.6898 \\
 \eta_1 = \quad \quad + 1 \\
 \eta_0 = +0.6897 \\
 \log \eta = 9.83866 \\
 \hline
 7.33115 \\
 2.50751
 \end{array}$$

$$X - A = +32.98$$

$$S - D = +521.7$$

$$\text{Corr to } \Delta\alpha = -0.05$$

$$\text{Corr to } \Delta\delta = +0.7$$

1308 1st half L 160 - L 351

$$\begin{array}{rclcl}
 + 19.72 & + & 1.05 & - & 12.01 = + 239 \\
 + 1.05 & + & 23.22 & - & 3.55 = - 755 \\
 - 12.01 & - & 3.55 & + & 10.00 = + 61
 \end{array}$$

$$\frac{\Delta x}{\Delta n} = + 1.25$$

$$\begin{array}{rclcl}
 - 1.05 & - & 6.06 & + & 0.64 = - 13 \\
 + 12.01 & + & 0.64 & - & 731 = + 146
 \end{array}$$

$$\frac{\Delta y}{\Delta n} = + 0.26$$

$$\begin{array}{rclcl}
 + 23.16 & - & 2.91 & = & - 768 \\
 - 2.91 & + & 269 & = & + 207
 \end{array}$$

$$\begin{array}{rclcl}
 + 2.91 & - & 0.37 & = & - 97 \\
 & + & 232 & = & + 110
 \end{array}$$

$$c = + 47.4$$

$$\begin{array}{rclcl}
 - 31.5 & + & 2.91 & = & + 224 \\
 + 20.01 & & & = & - 544
 \end{array}$$

$$b = - 27.1$$

$$\begin{array}{rclcl}
 - 0.05 & - & 1.05 & + & 0.16 = + 34 \\
 + 0.16 & + & 3.55 & - & 0.54 = + 115
 \end{array}$$

$$\begin{array}{rclcl}
 + 19.67 & & - 11.85 & = & + 273 \\
 - 11.85 & & + 9.46 & = & - 54
 \end{array}$$

$$\begin{array}{rclcl}
 - 14.83 & & + 11.85 & = & + 68 \\
 + 4.84 & & & = & + 205
 \end{array}$$

$$a = + 42.4$$

2nd half - L 0 - L 161

$$\begin{array}{rclcl}
 + 18.09 & - & 1.23 & + & 10.54 = + 536 \\
 - 1.23 & + & 16.30 & + & 1.47 = + 295 \\
 + 10.54 & + & 1.47 & + & 8.00 = + 464
 \end{array}$$

$$\frac{\Delta x}{\Delta n} = - 1.22$$

$$\begin{array}{rclcl}
 + 1.23 & - & 0.08 & + & 0.72 = + 36 \\
 - 10.54 & + & 0.72 & - & 6.13 = - 312
 \end{array}$$

$$\frac{\Delta y}{\Delta n} = - 0.28$$

$$\begin{array}{rclcl}
 + 16.22 & + & 2.19 & = & + 331 \\
 + 2.19 & + & 1.87 & = & + 152
 \end{array}$$

$$\begin{array}{rclcl}
 - 2.19 & - & 0.30 & = & - 45 \\
 & + & 1.57 & = & + 107
 \end{array}$$

$$c = + 68.2$$

$$\begin{array}{rclcl}
 - 25.6 & - & 2.19 & = & - 178 \\
 + 13.66 & & & = & + 153
 \end{array}$$

$$b = + 11.2$$

$$\begin{array}{rclcl}
 - 0.09 & + & 1.23 & + & 0.11 = + 22 \\
 + 0.11 & - & 1.47 & + & 0.13 = - 27
 \end{array}$$

$$\begin{array}{rclcl}
 + 18.00 & & + 10.65 & = & + 558 \\
 + 10.65 & & + 7.87 & = & + 437
 \end{array}$$

$$\begin{array}{rclcl}
 - 14.41 & & - 10.65 & = & - 591 \\
 + 3.59 & & & = & - 33
 \end{array}$$

$$a = - 9.2$$

$$\begin{array}{r}
 1309 \\
 X_0 = 18.0862 \\
 \frac{1}{2}u = \quad + 37. \\
 \hline
 18.0899
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.2125 \\
 \frac{1}{2}v = \quad - 8 \\
 \hline
 22.2117
 \end{array}$$

from plate constant $X = 19.6925$ $Y_0 = 23.2100$

$$\begin{array}{r}
 \bar{z} = +1.6925 \\
 \log \bar{z} = 0.22853 \\
 9.99915 \\
 \hline
 8.50724 \\
 1.72274
 \end{array}$$

$$\begin{array}{r}
 \eta = +1.2100 \\
 \eta_1 = \quad + 1 \\
 \eta_2 = +1.2099 \\
 \log \eta_0 = 0.08275 \\
 7.33115 \\
 \hline
 2.75160
 \end{array}$$

$$\alpha - A = \quad + 52.74$$

$$\delta - D = \quad + 9 \quad 24.4$$

$$\text{Over to } \Delta\delta = \quad + 0.12$$

$$\text{Over to } \Delta\delta = \quad - 0.3$$

$$\begin{array}{r}
 X_1 = 18.0862 \\
 \frac{1}{2}u = \quad - 64 \\
 \hline
 18.0798
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 22.2125 \\
 \frac{1}{2}v = \quad - 1 \\
 \hline
 22.2125
 \end{array}$$

from plate constant $X = 19.6824$

over to $\Delta\delta = 0.0$

$$\begin{array}{r}
 \bar{z} = +1.6824 \\
 \log \bar{z} = 0.22593 \\
 9.99915 \\
 \hline
 8.50724 \\
 1.71954
 \end{array}$$

$$\alpha - A = \quad + 52.43$$

$$\text{Over to } \Delta\delta = \quad - 0.19$$

1st half 4780° - 4357

$$\begin{array}{rclcl}
 + 13145 & 0.94 & - & 802 & = + 199 \\
 + 0.94 & + 2129 & - & 270 & = - 538 \\
 - 802 & - & 270 & + & 800 = + 212
 \end{array}$$

-393

$$\begin{array}{rclcl}
 - 0.94 & - & 0.07 & + & 0.57 = - 14 \\
 + 802 & + & 0.57 & - & 490 = + 122
 \end{array}$$

$$\begin{array}{rclcl}
 + 2122 & - & 213 & = & 552 \\
 - 213 & + & 310 & = & 334
 \end{array}$$

$$\begin{array}{rclcl}
 + 213 & - & 0.21 & = & 55 \\
 & + & 289 & = & 279
 \end{array}$$

$$\begin{array}{rclcl}
 - 1.46 & + & 213 & = & 229 \\
 + 9.76 & & & = & - 323
 \end{array}$$

$$\begin{array}{rclcl}
 - 0.04 & - & 0.94 & + & 0.12 = + 24 \\
 + 0.12 & + & 270 & - & 0.34 = - 64
 \end{array}$$

$$\begin{array}{rclcl}
 + 1310 & & & - & 790 = + 223 \\
 - 790 & & & + & 766 = + 144
 \end{array}$$

$$\begin{array}{rclcl}
 - 815 & & & + & 790 = + 148
 \end{array}$$

$$\begin{array}{rclcl}
 + 4.95 & & & & = + 371
 \end{array}$$

$$\frac{\Delta x}{\Delta z} = +1.25$$

$$\frac{\Delta y}{\Delta z} = +0.21$$

$$c = +96.5$$

$$b = +6.4$$

$$a = +75.0$$

2nd half 426 - 4154

$$\begin{array}{rclcl}
 + 1609 & - & 247 & + & 939 = - 239 \\
 - 247 & + & 971 & - & 140 = + 24 \\
 + 939 & - & 140 & + & 600 = + 1
 \end{array}$$

$$\frac{\Delta x}{\Delta z} = -1.21$$

$$\begin{array}{rclcl}
 + 247 & - & 0.38 & + & 1.44 = - 37 \\
 - 939 & + & 1.44 & - & 548 = + 140
 \end{array}$$

$$\frac{\Delta y}{\Delta z} = -0.01$$

$$\begin{array}{rclcl}
 + 9.33 & + & 0.04 & = & 13 \\
 - 0.04 & + & 0.52 & = & 99
 \end{array}$$

$$\begin{array}{rclcl}
 + 0.04 & + & 0.00 & = & 0 \\
 & + & 0.52 & = & 99
 \end{array}$$

$$c = +192.0$$

$$\begin{array}{rclcl}
 + 0.00 & - & 0.04 & = & 8 \\
 + 9.33 & & & = & 21
 \end{array}$$

$$b = -2.3$$

$$\begin{array}{rclcl}
 - 0.63 & + & 247 & - & 0.35 = + 6 \\
 - 0.35 & + & 140 & - & 0.20 = + 3
 \end{array}$$

$$\begin{array}{rclcl}
 + 15.46 & & & + & 904 = - 233
 \end{array}$$

$$\begin{array}{rclcl}
 + 904 & & & + & 580 = - 38
 \end{array}$$

$$\begin{array}{rclcl}
 - 14.10 & & & - & 904 = + 59
 \end{array}$$

$$\begin{array}{rclcl}
 + 136 & & & & = - 174
 \end{array}$$

$$a = -128.0$$

$$X_0 = 17.7212$$

$$\frac{1}{2}a = \frac{+4}{17.7216}$$

$$Y_0 = 21.8626$$

$$\frac{1}{2}b = \frac{-4}{21.8622}$$

From plate constants $X = 17.7143$ $Y = 21.9436$

$$z = -0.2857$$

$$\eta = -0.1564$$

$$\log \delta = 9.45591m$$

$$9.99905$$

$$\underline{8.50724}$$

$$0.94962m$$

$$\log \gamma = 9.19424m$$

$$7.33115$$

$$(\delta - \gamma) = 1.86309m$$

$$\alpha - A = -8.90$$

$$S - D = -113.0$$

$$\text{Conv to } \Delta \alpha = +0.01$$

$$\text{Conv to } \Delta S = -0.2$$

$$X_0 = 17.7212$$

$$\frac{1}{2}a = \frac{-13}{17.7199}$$

$$Y_0 = 21.8626$$

$$\frac{1}{2}b = \frac{-4}{21.8622}$$

From plate constants $X = 17.7126$ $Y = \text{same as above}$

$$z = -0.2874$$

$$\log \delta = 9.45849m$$

$$\log (\alpha - A) = 0.95220m$$

$$\alpha - A = -8.96$$

$$\text{Conv to } \Delta \alpha = -0.05$$

1310 - 1st half L 172-340

$$\begin{array}{rcl}
 + 15.71 + & 2.46 - & 94.6 = -147 \\
 + 24.6 + & 18.65 - & 46.6 = -248 \\
 - 94.6 - & 4.66 + & 8.00 = +176
 \end{array}$$

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

$$\begin{array}{rcl}
 - 2.46 - & 0.38 + & 14.8 = +23 \\
 + 9.46 + & 1.48 - & 5.69 = -88
 \end{array}$$

$$\frac{\Delta y}{\Delta z} = +0.36$$

$$\begin{array}{rcl}
 + 18.27 - & 3.18 = -22.5 \\
 - 3.18 + & 23.12 = +88
 \end{array}$$

$$\begin{array}{rcl}
 + 3.18 - & 0.55 = -39 \\
 + & 1.76 = +49
 \end{array}$$

$$c = +27.8^{\circ}$$

$$\begin{array}{rcl}
 - 4.38 + & 3.18 = +121 \\
 + 13.89 & = -104
 \end{array}$$

$$b = -75^{\circ}$$

$$\begin{array}{rcl}
 - 0.32 - & 2.49 + & 0.61 = +33 \\
 + 0.61 + & 4.66 - & 1.17 = -62
 \end{array}$$

$$\begin{array}{rcl}
 + 15.39 & - & 88.5 = -114 \\
 - 88.5 & + & 68.3 = +114
 \end{array}$$

$$\begin{array}{rcl}
 - 11.48 & + & 8.85 = +148
 \end{array}$$

$$\begin{array}{rcl}
 + 3.91 & = & +34
 \end{array}$$

$$a = +8.7^{\circ}$$

2d half L 8 - L 142

$$\begin{array}{rcl}
 + 14.16 + & 121 + & 8.51 = +513 \\
 + 121 + & 11.61 + & 24.8 = +131 \\
 + 8.51 + & 24.8 + & 6.00 = +387
 \end{array}$$

$$\frac{\Delta x}{\Delta z} = -1.21$$

$$\begin{array}{rcl}
 - 121 - & 0.10 - & 0.73 = -44 \\
 - 8.51 - & 0.73 - & 5.12 = -309
 \end{array}$$

$$\frac{\Delta y}{\Delta z} = -0.31$$

$$\begin{array}{rcl}
 + 11.51 + & 1.75 = +87 \\
 + 17.5 + & 0.88 = +78
 \end{array}$$

$$\begin{array}{rcl}
 - 1.75 - & 0.27 = -13 \\
 + & 0.61 = +65
 \end{array}$$

$$c = +106.6^{\circ}$$

$$\begin{array}{rcl}
 - 34.8 - & 1.75 = -155 \\
 + 8.03 & = -68
 \end{array}$$

$$b = -8.5^{\circ}$$

$$\begin{array}{rcl}
 - 0.13 - & 121 - & 0.26 = -14 \\
 - 0.26 - & 24.8 - & 0.53 = -28
 \end{array}$$

$$\begin{array}{rcl}
 + 14.03 & + & 8.25 = +499 \\
 + 8.25 & + & 5.47 = +359
 \end{array}$$

$$\begin{array}{rcl}
 - 12.44 & - & 8.25 = -541
 \end{array}$$

$$\begin{array}{rcl}
 + 1.59 & = & -42
 \end{array}$$

$$a = -26.4^{\circ}$$

$$\begin{array}{r}
 X_0 = 17.7354 \\
 \frac{1}{2}a = \quad -19 \\
 \hline
 17.7835
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 21.7397 \\
 \frac{1}{2}b = \quad -9 \\
 \hline
 21.7388
 \end{array}$$

From plate constant $X = 18.3845$ $Y = 22.3849$

$$z = +0.3845$$

$$\eta = +0.3849$$

$$\begin{array}{r}
 \log z = 9.58490 \\
 9.99902 \\
 \hline
 8.50724 \\
 1.07864
 \end{array}$$

$$\begin{array}{r}
 \log \eta = 9.58535 \\
 7.33115 \\
 \hline
 2.25420
 \end{array}$$

$$(\alpha - A) = + 11.98$$

$$\delta - D = + 259.6$$

$$\text{Corr to } \Delta \alpha = -0.06$$

$$\text{Corr to } \Delta \delta = -0.1$$

$$\begin{array}{r}
 X_0 = 17.7354 \\
 \frac{1}{2}a = \quad -7 \\
 \hline
 17.7347
 \end{array}$$

$$\begin{array}{r}
 Y_0 = 21.7397 \\
 \frac{1}{2}b = \quad -4 \\
 \hline
 21.7393
 \end{array}$$

From plate constant $X = 18.3857$ $Y = 22.3854$

$$z = +0.3857$$

$$\eta = +0.3854$$

$$\log z = 9.58625$$

$$\begin{array}{r}
 \log \eta = 9.58591 \\
 7.33115 \\
 \hline
 2.25476
 \end{array}$$

$$\log(\alpha - A) = 1.07999$$

$$\alpha - A = + 12.02$$

$$\delta - D = + 259.8$$

$$\text{Corr to } \Delta \alpha = -0.02$$

$$\text{Corr to } \Delta \delta = +0.1$$

1317 1st half L173° - L339

$$\begin{array}{rclcl}
 + 19.12^{\vee} + & 0.26^{\vee} - & 11.46^{\vee} = & - 662^{\vee} \\
 + 0.26^{\vee} + & 19.57^{\vee} - & 3.02^{\vee} = & - 347^{\vee} \\
 - 11.46^{\vee} - & 2.02^{\vee} + & 9.00^{\vee} = & + 437^{\vee}
 \end{array}$$

$$\begin{array}{rclcl}
 - 0.26 - & 0.00 + & 0.16 = & + 9 \\
 + 11.46 + & 0.16 - & 6.87 = & - 346
 \end{array}$$

$$\begin{array}{rclcl}
 + 19.57 - & 2.86 = & - 338 \\
 - 2.86 + & 2.13 = & + 41
 \end{array}$$

$$\begin{array}{rclcl}
 + 2.86 - & 0.42 = & - 49 \\
 & + 1.71 = & - 8
 \end{array}$$

$$\begin{array}{rclcl}
 - 3.84 + & 2.86 = & + 35 \\
 + 15.73 & = & - 283
 \end{array}$$

$$\begin{array}{rclcl}
 - 0.00 - & 0.26 + & 0.04 = & + 5 \\
 + 0.04 + & 3.02 - & 0.47 = & - 54
 \end{array}$$

$$+ 19.12 \quad - 11.42 = - 657$$

$$- 11.42 \quad + 8.53 = + 383$$

$$- 15.29 \quad + 11.42 = + 513$$

$$+ 3.83 \quad = - 143$$

$$\frac{\Delta v}{\Delta n} = +124$$

$$\frac{\Delta y}{\Delta n} = +0.30$$

$$c = - 4.7^{\vee}$$

$$k = - 18.0^{\vee}$$

$$a = - 37.4^{\vee}$$

2nd half L7 - L147

$$\begin{array}{rclcl}
 + 15.22^{\vee} - & 0.26^{\vee} + & 9.55^{\vee} = & + 647^{\vee} \\
 - 0.26^{\vee} + & 14.87^{\vee} + & 1.10^{\vee} = & - 6^{\vee} \\
 + 9.55^{\vee} + & 1.10^{\vee} + & 7.00^{\vee} = & + 487^{\vee}
 \end{array}$$

$$\begin{array}{rclcl}
 + 0.26 - & 0.00 + & 0.16 = & + 11 \\
 - 9.55 + & 0.16 - & 6.00 = & - 406
 \end{array}$$

$$+ 14.87 + \quad 1.26 = + 4$$

$$+ 1.26 + \quad 1.00 = + 81$$

$$- 1.26 - \quad 0.11 = - 0$$

$$+ \quad 0.89 = + 81$$

$$- 1.59 - \quad 1.26 = - 102$$

$$+ 13.28 \quad = - 97$$

$$\begin{array}{rclcl}
 - 0.01 + & 0.26 + & 0.02 = & - 0 \\
 + 0.02 - & 1.10 - & 0.08 = & + 0
 \end{array}$$

$$+ 15.21 \quad + 9.57 = + 647$$

$$+ 9.57 \quad + 6.92 = + 487$$

$$- 13.25 \quad - 9.57 = - 674$$

$$+ 1.96 \quad = - 27$$

$$\frac{\Delta y}{\Delta n} = - 1.30$$

$$\frac{\Delta y}{\Delta n} = - 0.18$$

$$c = + 91.0^{\vee}$$

$$k = - 7.3^{\vee}$$

$$a = - 13.8^{\vee}$$

312

$$X_0 = 17.8540$$

$$\frac{1}{2}a = \frac{+15}{17.8555}$$

$$Y_0 = 21.8546$$

$$\frac{1}{2}b = \frac{-6}{21.8540}$$

From plate constants $X = 19.0408$ $Y = 22.9001$

$$Z = +1.0408$$

corr. to $\Delta S = 0$

$$\log Z = 0.01737$$

$$9.99898$$

$$\underline{8.50724}$$

$$1.51115$$

$$d - A = +32.45$$

Corr to $\Delta X = +0.02$

$$X_0 = 17.8540$$

$$\frac{1}{2}a = \frac{-14}{17.8526}$$

$$Y_0 = 21.8546$$

$$\frac{1}{2}b = \frac{-31}{21.8515}$$

From plate constants $X = 19.0379$ $Y = 22.8975$

$$Z = +1.0379$$

$$\log Z = 0.01616$$

$$9.99898$$

$$\underline{8.50724}$$

$$1.50994$$

$$\eta = +0.8975$$

$$m_1 = +1$$

$$m_0 = +0.8974$$

$$\log \eta_0 = 9.95299$$

$$\underline{7.38115}$$

$$2.62184$$

$$(d - A) = +32.36$$

$$S - D = +6' 58.6$$

$$\text{Corr to } \Delta X = -0.07$$

$$\text{Corr to } \Delta Y = -1.5$$

1312 - 1st half - L 176 - L 336

$$\begin{array}{rcl}
 + 15.61 - & 2.61 - & 9.05 = + 83 \\
 - 2.61 + & 14.45 - & 0.77 = - 2.79 \\
 - 9.05 - & 0.77 + & 7.00 = + 60
 \end{array}$$

$$\frac{\Delta x}{\Delta z} = +1.26$$

$$\begin{array}{rcl}
 + 2.61 - & 0.44 - & 1.54 = + 14 \\
 + 9.05 - & 1.51 - & 5.24 = + 48
 \end{array}$$

$$\frac{\Delta y}{\Delta z} = +0.34$$

$$\begin{array}{rcl}
 + 14.01 - & 2.28 = - & 2.65 \\
 - 2.28 + & 1.76 = + & 1.08
 \end{array}$$

$$\begin{array}{rcl}
 + 2.28 - & 0.37 = - & 43 \\
 + & 1.39 = + & 65
 \end{array}$$

$$c = +46.7$$

$$\begin{array}{rcl}
 - 2.95 + & 2.28 = + & 140 \\
 + 11.06 & = - & 125
 \end{array}$$

$$b = -11.3$$

$$\begin{array}{rcl}
 - 0.47 + & 2.61 - & 0.14 = - 50 \\
 - 0.14 + & 0.77 - & 0.04 = - 15
 \end{array}$$

$$\begin{array}{rcl}
 + 15.14 & & 9.19 = + 33 \\
 - 9.19 & & + 6.96 = + 45
 \end{array}$$

$$\begin{array}{rcl}
 - 12.12 & & + 9.19 = + 59 \\
 + 3.02 & & = + 92
 \end{array}$$

$$a = +30.3$$

2d half L 4 - L 146

$$\begin{array}{rcl}
 + 13.48 + & 1.00 + & 8.13 = + 880 \\
 + 1.00 + & 12.32 + & 2.62 = - 364 \\
 + 8.13 + & 2.62 + & 6.00 = + 583
 \end{array}$$

$$\frac{\Delta x}{\Delta z} = -1.42$$

$$\begin{array}{rcl}
 - 1.00 - & 0.07 - & 0.60 = - 65 \\
 - 8.13 - & 0.60 - & 4.90 = - 530
 \end{array}$$

$$\frac{\Delta y}{\Delta z} = -6.34$$

$$\begin{array}{rcl}
 + 12.25 + & 2.02 = - & 429 \\
 + 2.02 + & 1.10 = + & 53
 \end{array}$$

$$\begin{array}{rcl}
 - 2.02 - & 0.33 = + & 71 \\
 + & 0.77 = + & 124
 \end{array}$$

$$L = +16.10$$

$$\begin{array}{rcl}
 - 3.71 - & 2.02 = - & 97 \\
 + 8.54 & = - & 526
 \end{array}$$

$$b = -61.6$$

$$\begin{array}{rcl}
 - 0.08 - & 1.00 - & 0.21 = + 30 \\
 - 0.20 - & 2.62 - & 0.56 = + 77
 \end{array}$$

$$\begin{array}{rcl}
 + 13.40 & & + 7.92 = + 910 \\
 + 7.92 & & + 5.44 = + 660
 \end{array}$$

$$\begin{array}{rcl}
 - 11.53 & & - 7.92 = - 961 \\
 + 1.87 & & = - 51
 \end{array}$$

$$a = -27.3$$

Summary

Original values - variable radius

	ΔS prec limb	fol. limb	whole limb	ΔS P.L.	F.L.	W.L.
1301	+0.57			+1.5		
1302	+0.44			-0.2		
1303	+0.53			+2.4		
1304	+0.61	+0.66	+0.50	+3.5	+3.7	+3.1
1305	+0.66	+0.54	+0.53	+3.1	+3.5	+3.1
1307	+0.61	+0.59	+0.53	+2.2	+2.9	+2.2
1308	+0.47	+0.27	+0.42	+2.0	+1.5	+2.0
1309	+0.67	+0.50	+0.55	+2.5	+2.8	+2.4
1310	+0.56	+0.43	+0.48	+1.6	+1.5	+1.5
1311	+0.47	+0.51	+0.53	+2.1	+2.7	+2.7
1312	+0.60	+0.44	+0.54	+2.5	+1.8	+2.2
1313		+0.49			+2.1	
1314		+0.58			+3.2	
1315		+0.47			+1.7	

Corrected for Hayn's limb values -

	ΔS P.L.	F.L.	W.L.	ΔS P.L.	F.L.	W.L.
1301	+0.55			+1.7		
1302	+0.50			-0.2		
1303	+0.53			+2.3		
4	+0.63	+0.45	+0.50	+3.8	+2.9	+3.4
5	+0.65	+0.43	+0.53	+3.1	+3.5	+3.3
7	+0.63	+0.44	+0.53	+2.6	+2.0	+2.4
8	+0.45	+0.37	+0.42	+1.8	+2.7	+2.2
9	+0.67	+0.36	+0.55	+2.1	+2.4	+2.1
10	+0.49	+0.43	+0.49	+1.3	+1.3	+1.5
11	+0.47	+0.51	+0.54	+2.6	+2.8	+2.9
12	+0.56	+0.47	+0.56	+2.2	+0.7	+1.8
13		+0.41			+1.0	
14		+0.60			+3.2	
15		+0.45			+1.7	

correction to standard radius $\Delta 8$ - to 1st + last 3 only
 with Haynes corr. with Haynes corr.

1301	+0.65	+0.63	+1.5	+1.7
2	+0.50	+0.56	-0.2	-0.2
3	+0.60	+0.60	+2.4	+2.3
4	+0.50	+0.50	+3.1	+3.4
5	+0.53	+0.53	+3.1	+3.3
7	+0.53	+0.53	+2.2	+2.4
8	+0.42	+0.42	+2.0	+2.2
9	+0.55	+0.55	+2.4	+2.1
10	+0.48	+0.49	+1.5	+1.5
11	+0.53	+0.54	+2.7	+2.8
12	+0.54	+0.56	+2.2	+1.8
13	+0.46	+0.38	+1.5	+0.4
14	+0.48	+0.50	+1.8	+1.8
15	+0.41	+0.39	+0.8	+0.8

Radial without Hayn's correction to limit

$$\begin{array}{r} 1301. - R^2 = 42308 \\ + 65 \\ \hline \end{array}$$

$$\begin{array}{r} R = 42373 \\ 20585 \\ \hline - 7 \\ R = 960.0 \\ S = 961.0 \end{array}$$

$$R-S = -1.0 \text{ P.L.}$$

$$\begin{array}{r} 1302 R^2 = 42437 \\ + 58 \\ \hline \end{array}$$

$$\begin{array}{r} 42495 \\ R = 20614 \\ \hline - 2 \\ R = 961.5 \\ S = 962.1 \end{array}$$

$$R-S = -0.6 \text{ P.L.}$$

$$\begin{array}{r} 1303 R^2 = 42462 \\ + 72 \\ \hline \end{array}$$

$$\begin{array}{r} 42534 \\ R = 20624 \\ \hline - 3.5 \\ R = 961.9 \\ S = 963.0 \end{array}$$

$$R-S = -1.1 \text{ P.L.}$$

$$\begin{array}{r} 1304 R^2 = 42828 \\ + 115 \\ \hline \end{array}$$

$$\begin{array}{r} 42943 \\ R = 20723 \\ \hline - 2 \\ R = 966.6 \\ S = 965.9 \end{array}$$

$$R-S = +0.7 \text{ P.L.}$$

$$\begin{array}{r} 1304 R^2 = 42824 \\ - 172 \\ \hline \end{array}$$

$$\begin{array}{r} 42652 \\ R = 20652 \\ \hline - 2 \\ R = 963.3 \\ S = 965.9 \end{array}$$

$$R-S = -2.6 \text{ F.L.}$$

$$\begin{array}{r} 1304 R^2 = 42826 \\ + 9 \\ \hline \end{array}$$

$$\begin{array}{r} 42835 \\ R = 20697 \\ \hline - 2 \\ R = 965.4 \\ S = 965.9 \end{array}$$

$$R-S = -0.5 \text{ W.L.}$$

$$\begin{array}{r} 1305 R^2 = 42882 \\ + 144 \\ \hline \end{array}$$

$$\begin{array}{r} 43026 \\ R = 20743 \\ \hline - 1 \\ R = 967.6 \\ S = 966.5 \end{array}$$

$$R-S = +1.1 \text{ P.L.}$$

$$\begin{array}{r} 1305 R^2 = 42876 \\ - 12 \\ \hline \end{array}$$

$$\begin{array}{r} 42864 \\ R = 20704 \\ \hline - 1 \\ R = 965.8 \\ S = 966.5 \end{array}$$

$$R-S = -0.7 \text{ F.L.}$$

$$\begin{array}{r} 1305 R^2 = 42879 \\ + 13 \\ \hline \end{array}$$

$$\begin{array}{r} 42892 \\ R = 20710 \\ \hline - 1 \\ R = 966.0 \\ S = 966.5 \end{array}$$

$$R-S = -0.5 \text{ W.L.}$$

$$\begin{array}{r} 1307 R^2 = 42996 \\ + 92 \\ \hline \end{array}$$

$$\begin{array}{r} 43088 \\ 20758 \\ \hline + 2 \\ R = 968.4 \\ S = 967.6 \end{array}$$

$$R-S = +0.8 \text{ P.L.}$$

$$\begin{array}{r} 1307 R^2 = 42996 \\ - 65 \\ \hline \end{array}$$

$$\begin{array}{r} 42931 \\ 20720 \\ \hline + 2 \\ R = 966.6 \\ S = 967.6 \end{array}$$

$$R-S = -1.0 \text{ F.L.}$$

$$\begin{array}{r} 1307 R^2 = 42996 \\ + 13 \\ \hline \end{array}$$

$$\begin{array}{r} 43009 \\ R = 20739 \\ \hline + 2 \\ R = 967.4 \\ S = 967.6 \end{array}$$

$$R-S = -0.2 \text{ W.L.}$$

$$\begin{array}{r} 1308 R^2 = 42968 \\ + 46 \\ \hline \end{array}$$

$$\begin{array}{r} 43014 \\ 20740 \\ \hline + 4 \\ R = 967.7 \\ S = 967.8 \end{array}$$

$$R-S = -0.1$$

$$\begin{array}{r} 1308 R^2 = 42968 \\ + 136 \\ \hline \end{array}$$

$$\begin{array}{r} 43104 \\ 20761 \\ \hline + 4 \\ R = 968.6 \\ S = 967.8 \end{array}$$

$$R-S = +0.8 \text{ F.L.}$$

1308

$$R^2 = 429.68$$

$$+ 14$$

$$429.82$$

$$R = 207.32$$

$$AR = +4$$

$$R = 967.3$$

$$S = 967.8$$

$$R-S = -0.5 \text{ WL}$$

1309

$$R^2 = 430.22$$

$$+ 19$$

$$430.39$$

$$207.43$$

$$AR = +1$$

$$R = 967.7$$

$$S = 967.9$$

$$R-S = -0.2 \text{ WL}$$

1310

$$R^2 = 429.57$$

$$+ 79$$

$$430.36$$

$$207.45$$

$$R = 967.8$$

$$S = 967.7$$

$$R-S = +0.1 \text{ P.L.}$$

1309

$$R^2 = 430.22$$

$$+ 1.55$$

$$430.77$$

$$R = 207.55$$

$$+ 1$$

$$R = 968.3$$

$$S = 967.9$$

$$R-S = +0.4 \text{ FL}$$

1310

$$R^2 = 429.57$$

$$+ 54$$

$$430.11$$

$$207.39$$

$$R = 967.5$$

$$S = 967.7$$

$$R-S = -0.2 \text{ FL}$$

1310

$$R^2 = 429.57$$

$$+ 1.2$$

$$429.69$$

$$207.29$$

$$+ 1$$

$$R = 967.1$$

$$S = 967.7$$

$$R-S = -0.6 \text{ WL}$$

1311

$$R^2 = 429.86$$

$$- 60$$

$$429.26$$

$$207.19$$

$$AR = +5$$

$$R = 966.7$$

$$S = 967.6$$

$$R-S = -0.9 \text{ P.L.}$$

1311

$$R^2 = 429.86$$

$$+ 29$$

$$430.15$$

$$207.40$$

$$+ 5$$

$$R = 967.7$$

$$S = 967.6$$

$$R-S = +0.1 \text{ FL}$$

1311

$$R^2 = 429.86$$

$$+ 12$$

$$429.98$$

$$207.36$$

$$+ 5$$

$$R = 967.6$$

$$S = 967.6$$

$$R-S = 0.0 \text{ W.L.}$$

1312

$$R^2 = 429.60$$

$$+ 66$$

$$430.26$$

$$207.45$$

$$AR = +3$$

$$R = 967.8$$

$$S = 967.5$$

$$R-S = +0.3 \text{ P.L.}$$

1312

$$R^2 = 429.60$$

$$+ 126$$

$$430.86$$

$$207.57$$

$$+ 3$$

$$R = 968.4$$

$$S = 967.5$$

$$R-S = +0.9 \text{ FL}$$

1312

$$R^2 = 429.60$$

$$+ 3$$

$$429.63$$

$$207.28$$

$$+ 3$$

$$R = 967.1$$

$$S = 967.5$$

$$R-S = -0.4 \text{ WL}$$

1313

$$R^2 = 428.85$$

$$- 6$$

$$428.79$$

$$207.07$$

$$+ 2$$

$$R = 966.1$$

$$S = 966.6$$

$$R-S = -0.5 \text{ FL}$$

1314

$$R^2 = 427.64$$

$$+ 7$$

$$427.71$$

$$206.81$$

$$- 4$$

$$R = 964.6$$

$$S = 966.3$$

$$R-S = -1.7 \text{ FL}$$

1315

$$R^2 = 428.18$$

$$- 29$$

$$427.89$$

$$206.85$$

$$- 7$$

$$R = 964.6$$

$$S = 966.0$$

$$R-S = -1.4 \text{ FL}$$

Radii with Hayn's Link Correction.

1301

$$R^2 = 4.2308$$

$$\begin{array}{r} + 58 \\ \hline 4.2366 \\ 2.0583 \end{array}$$

$$R = 959.8$$

$$S = 961.0$$

$$R-S = -1.2 \text{ P.L.}$$

1302

$$R^2 = 4.2437$$

$$\begin{array}{r} + 79 \\ \hline 4.2516 \\ 2.0620 \end{array}$$

$$R = 961.8$$

$$S = 962.1$$

$$R-S = -0.3 \text{ P.L.}$$

1303

$$R^2 = 4.2462$$

$$\begin{array}{r} + 78 \\ \hline 4.2540 \\ 2.0625 \end{array}$$

$$R = 961.9$$

$$S = 963.0$$

$$R-S = -1.1 \text{ P.L.}$$

1304

$$R^2 = 4.2828$$

$$\begin{array}{r} + 94 \\ \hline 4.2922 \\ 2.0718 \end{array}$$

$$R = 966.4$$

$$S = 965.9$$

$$R-S = +0.5 \text{ P.L.}$$

1304

$$R^2 = 4.2828$$

$$\begin{array}{r} + 16 \\ \hline 4.2844 \\ 2.0699 \end{array}$$

$$R = 965.5$$

$$S = 965.9$$

$$R-S = -0.4 \text{ F.L.}$$

1304

$$R^2 = 4.2828$$

$$\begin{array}{r} - 18 \\ \hline 4.2810 \\ 2.0690 \end{array}$$

$$R = 965.1$$

$$S = 965.9$$

$$R-S = -0.8 \text{ W.L.}$$

1305

$$R^2 = 4.2882$$

$$\begin{array}{r} + 107 \\ \hline 4.2989 \\ 2.0734 \end{array}$$

$$R = 967.1$$

$$S = 966.5$$

$$R-S = +0.6 \text{ P.L.}$$

$$R^2 = 4.2882$$

$$\begin{array}{r} + 70 \\ \hline 4.2952 \\ 2.0725 \end{array}$$

$$R = 966.7$$

$$S = 966.5$$

$$R-S = +0.2 \text{ F.L.}$$

$$R^2 = 4.2882$$

$$\begin{array}{r} - 2 \\ \hline 4.2879 \\ 2.0707 \end{array}$$

$$R = 965.9$$

$$S = 966.5$$

$$R-S = -0.6 \text{ W.L.}$$

1307

$$R^2 = 4.2996$$

$$\begin{array}{r} + 90 \\ \hline 4.3086 \\ 2.0757 \end{array}$$

$$R = 968.3$$

$$S = 967.6$$

$$R-S = +0.7 \text{ P.L.}$$

$$R^2 = 4.2996$$

$$\begin{array}{r} + 96 \\ \hline 4.3092 \\ 2.0759 \end{array}$$

$$R = 968.5$$

$$S = 967.6$$

$$+0.9 \text{ F.L.}$$

$$R^2 = 4.2996$$

$$\begin{array}{r} + 10 \\ \hline 4.3006 \\ 2.0738 \end{array}$$

$$R = 967.5$$

$$S = 967.6$$

$$-0.1 \text{ W.L.}$$

1308

$$R^2 = 4.2986$$

$$\begin{array}{r} + 47 \\ \hline 4.3033 \\ 2.0744 \end{array}$$

$$R = 967.9$$

$$S = 967.8$$

$$R-S = +0.1 \text{ P.L.}$$

$$R^2 = 4.2986$$

$$\begin{array}{r} + 68 \\ \hline 4.3054 \\ 2.0750 \end{array}$$

$$R = 968.0$$

$$S = 967.8$$

$$R-S = +0.2 \text{ F.L.}$$

$$R^2 = 4.2986$$

$$\begin{array}{r} + 30 \\ \hline 4.3016 \\ 2.0740 \end{array}$$

$$R = 967.7$$

$$S = 967.8$$

$$R-S = -0.1 \text{ W.L.}$$

1309.

$$R^2 = 4.3022$$

$$\begin{array}{r} + 96 \\ \hline 4.3118 \end{array}$$

$$R = 2.0765$$

$$aR = +1$$

$$R = 968.7$$

$$S = 967.9$$

$$R-S = +0.8 \text{ PL}$$

$$R^2 = 4.3022$$

$$\begin{array}{r} + 192 \\ \hline 4.3214 \end{array}$$

$$4.3214$$

$$2.0788$$

$$+1$$

$$R = 969.7$$

$$S = 967.9$$

$$R-S = +1.8 \text{ F.L.}$$

$$R^2 = 4.3022$$

$$\begin{array}{r} + .8 \\ \hline 4.3030 \end{array}$$

$$4.3030$$

$$2.0744$$

$$+1$$

$$R = 967.7$$

$$S = 967.9$$

$$R-S = -0.2 \text{ W.L.}$$

1310

$$R^2 = 4.2957$$

$$\begin{array}{r} + 28 \\ \hline 4.2985 \end{array}$$

$$4.2985$$

$$R = 2.0733$$

$$aR = +1$$

$$R = 967.2$$

$$S = 967.7$$

$$R-S = -0.5 \text{ PL}$$

$$R^2 = 4.2957$$

$$\begin{array}{r} + 107 \\ \hline 4.3064 \end{array}$$

$$4.3064$$

$$2.0752$$

$$+1$$

$$R = 968.1$$

$$S = 967.7$$

$$R-S = +0.4 \text{ F.L.}$$

$$R^2 = 4.2957$$

$$\begin{array}{r} + 41 \\ \hline 4.2998 \end{array}$$

$$4.2998$$

$$2.0736$$

$$+1$$

$$R = 967.4$$

$$S = 967.7$$

$$R-S = -0.3 \text{ W.L.}$$

1311

$$R^2 = 4.2986$$

$$\begin{array}{r} - 5 \\ \hline 4.2981 \end{array}$$

$$4.2981$$

$$R = 2.0732$$

$$aR = +5$$

$$R = 967.4$$

$$S = 967.6$$

$$R-S = -0.2 \text{ PL}$$

$$R^2 = 4.2986$$

$$\begin{array}{r} + 91 \\ \hline 4.3077 \end{array}$$

$$4.3077$$

$$2.0755$$

$$+5$$

$$R = 968.4$$

$$S = 967.6$$

$$R-S = +0.8 \text{ F.L.}$$

$$R^2 = 4.2986$$

$$\begin{array}{r} + 57 \\ \hline 4.3043 \end{array}$$

$$4.3043$$

$$2.0747$$

$$+5$$

$$R = 968.1$$

$$S = 967.6$$

$$R-S = +0.5 \text{ W.L.}$$

1312.

$$R^2 = 4.2960$$

$$\begin{array}{r} + 47 \\ \hline 4.3007 \end{array}$$

$$4.3007$$

$$2.0738$$

$$aR = +3$$

$$R = 967.6$$

$$S = 967.5$$

$$R-S = +0.1 \text{ PL}$$

$$R^2 = 4.2960$$

$$\begin{array}{r} + 161 \\ \hline 4.3121 \end{array}$$

$$4.3121$$

$$2.0766$$

$$+3$$

$$R = 968.8$$

$$S = 967.5$$

$$R-S = +1.3 \text{ F.L.}$$

$$R^2 = 4.2960$$

$$\begin{array}{r} + 56 \\ \hline 4.3016 \end{array}$$

$$4.3016$$

$$2.0740$$

$$+3$$

$$R = 967.6$$

$$S = 967.5$$

$$R-S = +0.1 \text{ W.L.}$$

1313

$$R^2 = 4.2885$$

$$\begin{array}{r} + 68 \\ \hline 4.2953 \end{array}$$

$$4.2953$$

$$2.0725$$

$$+2$$

$$R = 966.9$$

$$S = 966.6$$

$$R-S = +0.3 \text{ F.L.}$$

1314

$$R^2 = 4.2764$$

$$\begin{array}{r} - 19 \\ \hline 4.2745 \end{array}$$

$$4.2745$$

$$2.0675$$

$$-4$$

$$R = 964.3$$

$$S = 966.3$$

$$R-S = -2.0 \text{ F.L.}$$

1315

$$R^2 = 4.2818$$

$$\begin{array}{r} - 27 \\ \hline 4.2791 \end{array}$$

$$4.2791$$

$$2.0686$$

$$-7$$

$$R = 964.6$$

$$S = 966.0$$

$$R-S = -1.4 \text{ F.L.}$$

$$1315 - \lambda = -4.42 \quad \beta = +2.40 \quad c = -2.30$$

P	P-C	$\lambda \sin(p-c)$	$\mu \cos(p-c)$	D	Corr. from Haynes	O	O-C
313	336	+1.8	+2.2	-0.1	+0.4	+37	-4
318	341	+1.4	+2.3	-0.6	+0.3	+28	-69
349	12	-0.9	+2.4	-3.0	-0.6	-55	-72
0	23	-1.7	+2.2	-3.6	-0.2	-18	-89
17	40	-2.8	+1.8	-4.3	0.0	0	+26
47	70	-4.1	+0.8	-4.6	+0.2	+18	+62
51	74	-4.2	+0.7	-4.6	+0.8	+74	+64
78	101	-4.3	-0.5	-3.5	-0.2	-18	+8
90	113	-4.1	-0.9	-2.9	-1.9	-175	-290
107	130	-3.4	-1.5	-1.6	+0.6	+55	+122
128	151	-2.1	-2.1	+0.3	+1.5	+138	+101
141	164	-1.2	-2.3	+1.4	-0.9	-83	-23

giving (9) full wt.

$$+26.35 - 4.16 + 9.48 = +26.7$$

$$- 4.16 + 25.02 + 8.62 = -33.8$$

$$+ 9.48 + 8.62 + 12.00 = -14.5$$

$$+ 4.16 - 0.66 + 1.50 = +4.2$$

$$- 9.48 + 1.50 - 3.42 = -9.6$$

$$+24.36 + 10.12 = -29.6$$

$$+10.12 + 8.58 = -24.1$$

$$-10.12 - 4.20 = +12.3$$

$$+ 4.38 = -11.8$$

$$c = -26.9$$

$$-11.92 - 10.12 = +26.4$$

$$+12.44 = -1.2$$

$$t = -1.0$$

$$-749 - 6.81 - 9.48 = +11.5$$

$$-681 - 6.18 - 8.62 = +10.4$$

$$+18.84 - 10.97 = +38.2$$

$$-10.97 + 18.84 = -23.4$$

$$-637 + 10.97 = -13.6$$

$$+12.47 = +24.6$$

$$a = +19.7$$

O	C	O-C	old (O-C)
1 -41	-30 - 1 - 27 = -58	+17	+73
2 -97	-27 - 1 - 27 = -55	-42	+3
3 -17	-7 - 2 - 27 = -36	+19	-34
4 -71	+0 - 2 - 27 = -39	-32	-64
5 +26	+12 - 2 - 27 = -17	+43	+30
6 +64	+30 - 1 - 27 = +2	+62	+55
7 -10	+32 - 1 - 27 = +4	-14	+34
8 +26	+40 - 0 - 27 = +13	+13	-36
9 -115	+41 - 0 - 27 = +14	-129	(-336) 1/2 wt.
10 +67	+39 + 1 - 27 = +13	+54	+79
11 -37	+32 + 1 - 27 = +6	-43	+71
12 +60	+20 + 2 - 27 = +1	+59	-43
+243 - 388		+267 - 260	+345 - 515
Average = 53		Average (O-C) = 44 Average = 72	

