

KG
11366
v. 740

34567

88 37 30

46	26
1	<u>01.6</u>
45	01.0
22	49
88	<u>37 48</u>

37 18 50
185

Formula for the change of $a'-a$ for a change in S Let-

$$a(a'-a) = g \sin(l+a) \sec^2 \delta \sin i + h \cos(l+a) \sec \delta \tan \delta \sin i$$

$$g \sec^2 \delta \sin i = a'$$

$$h \sec \delta \tan \delta \sin i = b'$$

$$h \cos \delta \sin i = c'$$

$$-c' \sin \delta \sin i = d'$$

Formula for the change of $S'-S$

$$a(S'-S) = h \cos(l+a) \cos \delta \sin i - c \sin \delta \sin i$$

Then

$$a(a'-a) = I_1 + II_1$$

$$a(d'-S) = II_2 + III_2$$

Formula for reduction to apparent place.
any date of
from 1870 to 1875.0

$$g' \sin l' = B$$

$$g' \cos l' = 20''.0547(A-5)$$

any date of
from 1871 to 1875.0

$$g' \sin l' = B$$

$$g' \cos l' = 20.0547(A-4)$$

{A and B Taken for the given date.}

$$\text{Then } a'-a = (A-4)m + g' \tan \delta \sin(l'+a) + h \sec \delta \sin(l'+a)$$

$$d'-S = g' \cos(l'+a) + h \sin \delta \cos(l'+a) + c \cos \delta$$

$$\text{Let } g' \tan \delta = a$$

$$h \sec \delta = b$$

$$h \sin \delta = c$$

Then

$$a'-a = (A-4)m + a \sin(l'+a) + b \sin(l'+a) = (A-4)m + I + II$$

$$d'-S = g' \cos(l'+a) + c \cos(l'+a) + c \cos \delta = I' + II' + III'$$

4
50 S
42 23
4 25

Y
lobular expansion in a and S = 50° 30'

<i>a</i>	$\frac{da}{dt}$	$\frac{d\theta}{dt}$
0 00	3.07 ^s	+ .33
15	17	.33
30	28	.33
45	38	.38
00	48	.32
15	58	.31
30	69	.31
45	78	.30
00	88	.29
15	3.97	.28
30	4.06	.26
45	14	.25
00	22	.23
15	29	.22
30	36	.20
45	42	.18
00	48	.17
15	53	.16
30	59	.13
45	60	.11
00	64	.09
15	66	.06
30	68	.04
45	68	.02
00	69	+ .00
15	67	- .02
30	65	.04
45	65	.06
00	69	.09
15	60	.11
30	57	.13
45	52	.16
00	48	.17
15	42	.18
30	36	.20
45	29	.22
00	22	.23
15	4.14	.25
30	4.06	.26
45	3.97	.28
00	38	.29
15	38	.30
30	69	.31
45	58	.32
00	49	.32
15	38	.33
30	.28	.33
45		.33
12 00	3.07	- .33

<i>h</i>	$\frac{dh}{dt}$	$\frac{d\theta}{dt}$
12 00	2.07	- .33
15	2.95	.33
30	3.8	.33
45	4.5	.33
00	6.5	.32
15	8.5	.32
30	4.5	.31
45	3.5	.30
00	2.6	.29
15	1.0	.28
30	2.08	.26
45	2.00	.25
00	1.92	.23
15	1.86	.22
30	1.79	.20
45	.73	.18
00	.67	.17
15	.62	.16
30	.58	.13
45	.54	.11
00	.50	.09
15	.49	.06
30	.48	.04
45	.47	.02
00	.45	+ .00
15	.46	+ .02
30	.48	.04
45	.48	.06
00	.50	.09
15	.54	.11
30	.58	.13
45	.63	.16
00	.68	.17
15	.73	.18
30	.79	.20
45	.85	.22
00	.92	.23
15	1.00	.25
30	2.07	.26
45	1.6	.28
00	2.1	.29
15	3.6	.30
30	4.5	.31
45	5.5	.32
00	6.5	.32
15	7.5	.33
30	8.5	.33
45	2.75	.33
24 00	3.07	.33

.00028
 72
 56
 1.96
 62016
 0.623
 46.0825
 153608
 3.0722

 0.0084
 72
 1.92
 60.2
 0.6182
 20.0607
 20.087
 20.0596

Fundamental Stars from 40° to 63° for 1855

β Cass.	α	δ	$\log p$
22 And.	0	2 47	45 16
κ Cass	0	24 47	62 8
η Cass.	0	28 55	53 6
α Cass	0	32 18	55 44
σ Cass	0	36 40	47 29
ζ Cass	0	40 21	57 3
δ 82	0	41 58	63 27
γ Cass	0	48 00	54 56
ι Cass	1	16 23	59 29
ϵ Persei	1	29 6	47 54
η Persei	1	34 36	49 57
ϵ Cass	1	44 00	62 57
γ And.	1	55 11	41 38
δ Persei	2	04 00	50 23
θ Persei	2	34 20	48 37
ζ Persei	2	40 09	55 17
τ Persei	2	44 10	52 10
γ Persei	2	54 19	52 56
β Persei	3	58 45	40 24
ι Persei	2	58 37	49 03
α Persei	3	14 0	49 20
24 Camd.	3	17 21	59 26

	α	δ
α Cephei	20 42 20	61° 17'
ν Cygni	20 51 46	40 37
ϵ Cygni	20 59 40	43 21
η	21 34 15	21 87
ω Cephei	21 15 7	61 58
γ Cygni	21 24 6	45 54
13 Cephei	21 34 28	56 50
π Cygni	21 41 26	48 38
20 Cephei	22 0 36	62 05
ϵ Cephei	22 5 50	57 29
3 Lacert	22 17 52	57 30
δ Cephei	22 23 48	57 40
7 Lacert.	22 25 20	49 32
30 Cephei	22 33 31	62 50
13 Lacert.	22 37 38	41 04
ϕ Androm.	22 55 15	41 33
η 3077	23 6 19	56 22
γ Cass.	23 18 25	61 29
χ Androm.	23 30 29	45 40
ϵ Androm.	23 31 2	42 28
κ Androm.	23 33 17	43 32
α Cass.	23 47 09	56 42

Table for reduction to the horizontal wire. (Eggleston)

Argument = distance in seconds of time from the middle wire
angle of inclination of wires adopted Nov. 8 1874 = $2^{\circ} 15' 16''$ $\tan \sin \log = 8.54470$ 8.89539

$\log \sin$	$1^{\circ} = 15''$	5.461	1.17609	$59''$	$378'' 371''$
2	30	30	1.47712	1.18	.59
3	45	45	1.68321	1.77	.59
4	1 0	60	1.77815	2.36	.59
5	1 15	75	1.87506	2.95	.59
6	1 30	90	1.95424	3.54	.59
7	1 45	105	2.02119	4.13	.59
8	2 00	120	2.07918	4.72	.59
9	2 15	135	2.13033	5.31	.59
10	2 30	150	2.17609	5.90	.59
11	2 45	165	2.21748	6.49	.59
12	3 00	180	2.25527	7.08	.59
13	3 15	195	2.29003	7.67	.59
14	3 30	210	2.32222	8.26	.59
15	3 45	225	2.35218	8.85	.59
16	4 00	240	2.38021	9.44	.59
17	4 15	255	2.40654	10.03	.59
18	4 30	270	2.43136	10.62	.59
19	4 45	285	2.45484	11.21	.59
20	5 00	300	2.47712	11.80	.59
21	5 15	315	2.49831	12.39	.59
22	5 30	330	2.51851	12.98	.59
23	5 45	345	2.53782	13.57	.59
24	6 00	360	2.55630	14.16	.59
25	6 15	375	2.57403	14.75	.59
26	6 30	390	2.59106	15.34	.59
27	6 45	405	2.60745	15.93	.59
28	7 00	420	2.62325	16.52	.59

A change of 1' in the value of the inclination produces a change of .004 in the value of y .

$$R = (T_m - T_s) \sin 2' 15' \cos S$$

Table for reduction to the meridian

Argument = $T - m$. $S = 50^{\circ} 30'$ $\log \sin S = 9.69092$

$T - m$	$\log 2 \sin \frac{21}{2} (T - m)$	R
0	0.00	.00
1		.00
2		.00
3		.00
4		.01
5	8.13467	.01
6		.01
7		.01
8		.02
9		.02
10	8.73673	.03
11		.03
12		.04
13		.04
14		.05
15	9.08891	.06
16		.07
17		.08
18		.09
19		.10
20	9.33879	.11
21		.12
22		.13
23		.14
24		.16
25	9.53261	.17
26		.18
27		.19
28		.20
29		.22
30	9.69097	.24

A change of 1' in the value of S does not affect the value of R as much as .01"

Practically $T = T_m + \frac{1}{2} (T_m - T_s)$ may be taken for $T - m$. Since by the arrangement of the inclined wire the transit across it always occurs East of the meridian T will always be negative.

Sobular tang Sand vs S from 50° to 51°

	<i>tang S</i>	<i>sec S</i>
$\hat{S} = 50^{\circ} 0'$	1.19 ^{.02}	1.55 ^{.02}
50 30'	1.21 ^{.02}	1.57 ^{.02}
51 00	1.23 ^{.02}	1.59 ^{.02}

Table for the reduction of revolutions of the micrometer head to arc.

$\hat{S}$	$\hat{S}$	$\hat{S}$	$\hat{S}$	$\hat{S}$
		$\hat{S}$ in hundredths		$\hat{S}$ in thousandths
1 = 0	3711	.01	0.37	1896
2	1439	.02	.74	1933
3	5481	.03	1.12	1970
4	2868	.04	1.49	2007
5	5.85	.05	1.86	2044
6	43.02	.06	2.23	2082
7	20.19	.07	2.60	2119
8	57.36	.08	2.97	2156
9	34.53	.09	3.35	2193
10	11.70	.10	3.72	2230
11	48.87	.11	4.09	2267
12	26.04	.12	4.46	2304
13	83.21	.13	4.83	2342
14	40.38	.14	5.20	2379
15	17.55	.15	5.58	2416
16	54.72	.16	5.95	2453
17	31.89	.17	6.32	2490
18	9.06	.18	6.69	2528
19	46.23	.19	7.06	2565
20	23.40	.20	7.43	2602
		.21	7.81	2639
		.22	8.18	2676
		.23	8.55	2713
		.24	8.92	2750
		.25	9.29	2788
		.26	9.66	2825
		.27	10.04	2862
		.28	10.41	2899
		.29	10.78	2936
		.30	11.15	2974
		.31	11.52	3011
		.32	11.90	3048
		.33	12.27	3086
		.34	12.64	3122
		.35	13.01	3159
		.36	13.38	3197
		.37	13.75	3234
		.38	14.12	3271
		.39	14.50	3308
		.40	14.87	3345
		.41	15.24	3382
		.42	15.61	3419
		.43	15.98	3457
		.44	16.36	3494
		.45	16.73	3531
		.46	17.10	3568
		.47	17.47	3605
		.48	17.84	3642
		.49	18.21	3680
		.50	18.58	3717

Table for reduction to the middle wire, The values of i being from Nov. 10 to as follows:

$$\begin{array}{r}
 +12.39 \\
 9.86 \\
 7.39 \\
 4.88 \\
 \hline
 +86.3
 \end{array}
 \begin{array}{r}
 -4.99 \\
 7.45 \\
 9.89 \\
 12.42 \\
 \hline
 -8.69
 \end{array}
 \log = 0.93902$$

S	i
49° 50'	13.47
55	13.46
50 00	13.52
5	13.55
10	13.57
15	13.59
20	13.61
25	13.64
30	13.66
35	13.68
40	13.71
45	13.73
50	13.75
55	13.78
51 00	13.81

The above answers only for Nov. 1 to Nov. 5
Table from Nov. 10 to

$$\begin{array}{r}
 - C.5 \\
 - 4.81 \\
 7.22 \\
 9.72 \\
 \hline
 12.26
 \end{array}$$

Mean 8.50 $\log = 0.92942$

S	i
49° 50'	13.17
55	13.20
50 00	13.22
5	13.25
10	13.27
15	13.29
20	13.31
25	13.33
30	13.36
35	13.38
40	13.41
45	13.43
50	13.45
55	13.47
51 00	13.50

$$\begin{array}{r}
 0.00 \\
 4.81 \\
 7.22 \\
 9.72 \\
 \hline
 12.26 \\
 34.01 \\
 6.802 \\
 .83264
 \end{array}$$

Formulae for the reduction of Meridian Circle zone observations

Let D = any assumed declination

T = $ST + m$ = the clock error + m for any given instant -

i = $m \tan D + c \sec D$

$4i$ = the change for 100' in D

z = $A-5$ for 1870 $A-4$ for 1871 $A-3$ for 1872 & c

C = $A_2(\log B + \log T) + 7 \log \gamma$

l = the a of Bessel

I = The index error of the circle

R = The reduction to the meridian = $-F \cos \delta \sin \delta$ (where $F = \frac{2 \delta \sin^2 \frac{1}{2} (T_m - T_r)}{L''}$)

$R' = (T_m - T_r) \sin^2 \frac{1}{2} \cos D + 157 \log \gamma$

E = division error of the circle.

$s = \frac{\tan D}{15}$

$t = \frac{\sec D}{15}$

$u = \cos D \tan \omega$

$v = \sin D$

$q = l \tan(\varphi - D)$

Then

$S' = 8.4637 \frac{\sec^2 D}{15} =$

$T' = 8' \sin D$

$u' = -8.4637 \tan \omega \sin D$

$v' = 8.4637 \cos D$

$dq = 8.4637 \sec^2(\varphi - D) d\varphi \tan(\varphi - D)$

$k = T + i - z - g \sin(\zeta + a) - h \tau \sin(\eta + a) \quad \Delta \zeta$

$k' = 4i - g S' \sin(\zeta + a) - h T' \sin(\eta + a)$

$d = -l' q \pm I + R + R' + E - bu - g \cos(\zeta + a) - h v \cos(\eta + a)$

$d' = +l' dq + du' - h v' \cos(\eta + a)$

Wine intervals from Polaris^{2R} Nov 13 & 27 $\delta = 88^{\circ} 34' 21''$

	Nov. 13	Nov. 27	Mean	S'
$T_a =$	8 37.6	8 34.1	8 35.85 =	515.55
t	6 50.9	6 49.3	6 50.10	410.10
c	5 8.9	5 7.1	5 8.00	308.00
d	3 27.1	3 25.2	3 26.15	207.15
T_c	3 25.6	3 28.6	3 27.10	207.10
t	5 7.8	5 9.5	5 8.65	308.65
c	6 50.6	6 52.8	6 51.70	411.70
d	8 36.2	8 35.9	8 36.05	516.05

$$\cos \delta = 8.38098$$

$\log I$	$\log I \cos \delta$	$\log k$	$\log i$	i
2.71252	1.09345	0.010	1.09335	+12.40
61289	0.99382	7	99375	9.86
48855	86948	3	86945	7.40
31420	69513	1	69513	4.96
31618	69711	1	69710	4.98
48941	87040	3	87037	4.92
61458	0.99551	7	99544	9.90
71269	1.09362	10	09352	12.40

Values adopted Nov. 10 1870

$$\begin{array}{r} T - T_c \\ t \\ c \\ d \\ \hline -4.98 \\ 7.42 \\ 7.90 \\ 12.40 \\ \hline 34.70 \end{array}$$

$$8.675 \log = .93827$$

$$\begin{array}{r} 12.40 \\ 9.86 \\ 7.40 \\ 4.96 \\ 0.00 \\ \hline 34.62 \\ 8.655 \\ \hline 9.93727 \end{array}$$

Jan 4
Polaris True Pole

$T_m - T_a$	8 34.3	$T_m - T_c$	3 25.8
t	6 50.4	t	5 13.5
c	5 7.3	c	7 12.5
d	3 25.8	d	8 07.7

Supplementary table of constants for zero stars 1880.

Star	α	δ	$\tan \delta$	z	$\log \tan z$	$\log \sec z$	$\log \tan \delta$	$\log \sec \delta$	$\log \sec$	$\log \sec$	$\log \sec$	$\log \sec$
α Cygni	20 37 11	44 45 26	.98	-2 26 38	8.6300	0.14919	9.84815	9.85004	12.23	5.08350	8.9445	9.912
δ Cygni	20 52 21	40 40 30	.86	+1 42 18	8.4735	.12009	9.81409	9.87991	11.44	5.07754	8.9899	9.951
β Cygni	21 01 05	38 6 9	.78	+4 16 39	8.8727	.10408	9.79034	9.85592	11.02	5.05980	8.9526	9.965
α Cephei	21 15 29	62 02 35	.88	-19 39 47	9.5531	.32899	9.84610	9.67101	18.50	5.04165	8.91250	9.79
γ 3415										6.177874	9.6889	
η Cygni											9.77228	
											9.91403	

Reduction for No. 10 1820 to 1875, 0

$92 = 50^{\circ} 30'$
 $101 \quad 00'$

4-D-1-8° 7'

log A 9.6977

$$m \cdot 1572.5 = 3.0722$$

$$n'' = 20.0545$$

log tny 2-0839
 8.9229) $\cos^2$ 1965
 8.95139 Sin $\frac{1}{2}$ 9.8035
 9.96740 Tan($\frac{1}{2}$) 9.8874
 9.74249 $\frac{1}{2}$ 9.6373
 total 17614
 val = 0
 $\frac{1}{2}$ 0043

g	178	43
a	337	30
no	36	55
g+a	156	13
n+a	16	25
avg	1,2950.	
loyle	1.0931	

$\log 4 = .4886$
 $\log 5 = .45014$
 $\log 65 = .65325$
 $\log 1.30222$
 $\log 65 = .95557$
 $\log 65 = .30770 = \log B$
 $\log 65 = 8.35213$
 $\log 1.17 = .17$
 $= 1.843$
 $\log 1.9557$

$\log(A-5) = 6.5335$
 $\log m = 4.8745$
 $\log R = 1.14080$
 $R = -13.830$

$$n = +25$$

$\cos S = 8.9078$

$\log 8' = 76806$

$$\log_9 5 = 8635 \log_9 NT = 3154$$

$\log n = 9.3979$
 $\log 5030 = 0.839$
 $\log c = 9.4818$
 $i = 303$

Log N 9.3979
 Log 5210 10.98
 Log 3 9.5077
 522

Coz T	9.0204
Coz u	9.4408
Coz v	9.8874
Coz a	9.156 _u

Coz 1' 7.5650
Coz 1' 7.9854
Coz 2' 8.2672
Coz 2' 8.4650

log kv. 1829
log bu. 5339
bu 34½

$$40 = 40.19^\circ$$

Ban 30.15
Alt Thum 70.6
Exp Thum 138
log B 1080 log 8. 01
log T 0015m
log R x 0095m

A' = 1
R' = 1
log a'

Sig B. 0095m
x log 0181
log a' + 0036
9156m
log a .9156
ck - 8.88
10.04
1.73

	a	2	2^2	30	$(\beta+a)$	$(\gamma+a)$	$\log(\beta+a)$	$\log(\gamma+a)$	$\log(\alpha+\beta+a)$	$\log \alpha(\gamma+a)$	$\log \alpha(\beta+a)$
					15613	16254	46056	59615	79615	94512	95519
				40	15843	1855	955988	996932	50780	92584	
				50	16113	2125	50788	97623	56247	96893	
	23		0	16343	2355	44786	88222	60889	96101		
			10	16613	2625	37703	88731	69826	95211		
731			20	16843	2855	29150	98152	68443	94217		
			30	17113	3125	18383	99480	71705	93155		
			40	17343	3355	13920	99738	74662	91900		
			50	17613	3625	88794	99905	77353	90565		
0			0	17843	3855	835018	99989	79809	89107		
			10	18113	4125	82702	99990	82055	87501		
			20	18343	4355	81773	99909	84112	85754		
			30	18613	4625	803458	99744	85996	83848		
			40	18843	4855	18055	99485	87773	81767		
			50	19113	5125	28896	99162	88309	79994		
1			0	19343	5355	37457	98743	90750	77007		
			10	19613	5625						
			20	19843	5855						
			30	20113	6125						

[illegible][illegible]

-	22	30	-175	-021	+019	-177	162	147	132	116	100	85	69	53	37	21	5	-1	15	29	43	57	71	85	99	113	127	141	155	169	183	197	211	225	239	253	267	281	295	309	323	337	351	365	379	393	407	421	435	449	463	477	491	505	519	533	547	561	575	589	603	617	631	645	659	673	687	701	715	729	743	757	771	785	799	813	827	841	855	869	883	897	911	925	939	953	967	981	995	1009	1023	1037	1051	1065	1079	1093	1107	1121	1135	1149	1163	1177	1191	1205	1219	1233	1247	1261	1275	1289	1303	1317	1331	1345	1359	1373	1387	1401	1415	1429	1443	1457	1471	1485	1499	1513	1527	1541	1555	1569	1583	1597	1611	1625	1639	1653	1667	1681	1695	1709	1723	1737	1751	1765	1779	1793	1807	1821	1835	1849	1863	1877	1891	1905	1919	1933	1947	1961	1975	1989	2003	2017	2031	2045	2059	2073	2087	2101	2115	2129	2143	2157	2171	2185	2199	2213	2227	2241	2255	2269	2283	2297	2311	2325	2339	2353	2367	2381	2395	2409	2423	2437	2451	2465	2479	2493	2507	2521	2535	2549	2563	2577	2591	2605	2619	2633	2647	2661	2675	2689	2703	2717	2731	2745	2759	2773	2787	2801	2815	2829	2843	2857	2871	2885	2899	2913	2927	2941	2955	2969	2983	2997	3011	3025	3039	3053	3067	3081	3095	3109	3123	3137	3151	3165	3179	3193	3207	3221	3235	3249	3263	3277	3291	3305	3319	3333	3347	3361	3375	3389	3403	3417	3431	3445	3459	3473	3487	3501	3515	3529	3543	3557	3571	3585	3599	3613	3627	3641	3655	3669	3683	3697	3711	3725	3739	3753	3767	3781	3795	3809	3823	3837	3851	3865	3879	3893	3907	3921	3935	3949	3963	3977	3991	4005	4019	4033	4047	4061	4075	4089	4103	4117	4131	4145	4159	4173	4187	4201	4215	4229	4243	4257	4271	4285	4299	4313	4327	4341	4355	4369	4383	4397	4411	4425	4439	4453	4467	4481	4495	4509	4523	4537	4551	4565	4579	4593	4607	4621	4635	4649	4663	4677	4691	4705	4719	4733	4747	4761	4775	4789	4803	4817	4831	4845	4859	4873	4887	4901	4915	4929	4943	4957	4971	4985	4999	5013	5027	5041	5055	5069	5083	5097	5111	5125	5139	5153	5167	5181	5195	5209	5223	5237	5251	5265	5279	5293	5307	5321	5335	5349	5363	5377	5391	5405	5419	5433	5447	5461	5475	5489	5503	5517	5531	5545	5559	5573	5587	5601	5615	5629	5643	5657	5671	5685	5699	5713	5727	5741	5755	5769	5783	5797	5811	5825	5839	5853	5867	5881	5895	5909	5923	5937	5951	5965	5979	5993	6007	6021	6035	6049	6063	6077	6091	6105	6119	6133	6147	6161	6175	6189	6203	6217	6231	6245	6259	6273	6287	6301	6315	6329	6343	6357	6371	6385	6399	6413	6427	6441	6455	6469	6483	6497	6511	6525	6539	6553	6567	6581	6595	6609	6623	6637	6651	6665	6679	6693	6707	6721	6735	6749	6763	6777	6791	6805	6819	6833	6847	6861	6875	6889	6903	6917	6931	6945	6959	6973	6987	7001	7015	7029	7043	7057	7071	7085	7099	7113	7127	7141	7155	7169	7183	7197	7211	7225	7239	7253	7267	7281	7295	7309	7323	7337	7351	7365	7379	7393	7407	7421	7435	7449	7463	7477	7491	7505	7519	7533	7547	7561	7575	7589	7603	7617	7631	7645	7659	7673	7687	7701	7715	7729	7743	7757	7771	7785	7799	7813	7827	7841	7855	7869	7883	7897	7911	7925	7939	7953	7967	7981	7995	8009	8023	8037	8051	8065	8079	8093	8107	8121	8135	8149	8163	8177	8191	8205	8219	8233	8247	8261	8275	8289	8303	8317	8331	8345	8359	8373	8387	8401	8415	8429	8443	8457	8471	8485	8499	8513	8527	8541	8555	8569	8583	8597	8611	8625	8639	8653	8667	8681	8695	8709	8723	8737	8751	8765	8779	8793	8807	8821	8835	8849	8863	8877	8891	8905	8919	8933	8947	8961	8975	8989	9003	9017	9031	9045	9059	9073	9087	9101	9115	9129	9143	9157	9171	9185	9199	9213	9227	9241	9255	9269	9283	9297	9311	9325	9339	9353	9367	9381	9395	9409	9423	9437	9451	9465	9479	9493	9507	9521	9535	9549	9563	9577	9591	9605	9619	9633	9647	9661	9675	9689	9703	9717	9731	9745	9759	9773	9787	9801	9815	9829	9843	9857	9871	9885	9899	9913	9927	9941	9955	9969	9983	9997	10011	10025	10039	10053	10067	10081	10095	10109	10123	10137	10151	10165	10179	10193	10207	10221	10235	10249	10263	10277	10291	10305	10319	10333	10347	10361	10375	10389	10403	10417	10431	10445	10459	10473	10487	10501	10515	10529	10543	10557	10571	10585	10599	10613	10627	10641	10655	10669	10683	10697	10711	10725	10739	10753	10767	10781	10795	10809	10823	10837	10851	10865	10879	10893	10907	10921	10935	10949	10963	10977	10991	11005	11019	11033	11047	11061	11075	11089	11103	11117	11131	11145	11159	11173	11187	11201	11215	11229	11243	11257	11271	11285	11299	11313	11327	11341	11355	11369	11383	11397	11411	11425	11439	11453	11467	11481	11495	11509	11523	11537	11551	11565	11579	11593	11607	11621	11635	11649	11663	11677	11691	11705	11719	11733	11747	11761	11775	11789	11803	11817	11831	11845	11859	11873	11887	11901	11915	11929	11943	11957	11971	11985	11999	12013	12027	12041	12055	12069	12083	12097	12111	12125	12139	12153	12167	12181	12195	12209	12223	12237	12251	12265	12279	12293	12307	12321	12335	12349	12363	12377	12391	12405	12419	12433	12447	12461	12475	12489	12503	12517	12531	12545	12559	12573	12587	12601	12615	12629	12643	12657	12671	12685	12699	12713	12727	12741	12755	12769	12783	12797	12811	12825	12839	12853	12867	12881	12895	12909	12923	12937	12951	12965	12979	12993	13007	13021	13035	13049	13063	13077	13091	13105	13119	13133	13147	13161	13175	13189	13203	13217	13231	13245	13259	13273	13287	13301	13315	13329	13343	13357	13371	13385	13399	13413	13427	13441	13455	13469	13483	13497	13511	13525	13539	13553	13567	13581	13595	13609	13623	13637	13651	13665	13679	13693	13707	13721	13735	13749	13763	13777	13791	13805	13819	13833	13847	13861	13875	13889	13903	13917	13931	13945	13959	13973	13987	13999	14011	14025	14039	14053	14067	14081	14095	14109	14123	14137	14151	14165	14179	14193	14207	14221	14235	14249	14263	14277	14291	14305	14319	14333	14347	14361	14375	14389	14403	14417	14431	14445	14459	14473	14487	14501	14515	14529	14543	14557	14571	14585	14599	14613	14627	14641	14655	14669	14683	14697	14711	14725	14739	14753	14767	14781	14795	14809	14823	14837	14851	14865	14879	14893	14907	14921	14935	14949	14963	14977	14991	15005	15019	15033	15047	15061	15075	15089	15103	15117	15131	15145	15159	15173	15187	15201	15215	15229	15243	15257	15271	15285	15299	15313	15327	15341	15355	15369	15383	15397	15411	15425	15439	15453	15467	15481	15495	15509	15523	15537	15551	15565	15579	15593	15607	15621	15635	15649	15663	15677	15691	15705	15719	15733	15747	15761	15775	15789	15803	15817	15831	15845	15859	15873	15887	15901	15915	15929	15943	15957	15971	15985	15999	16013	16027	16041	16055	16069	16083	16097	16111	16125	16139	16153	16167	16181	16195	16209	16223	16237	16251	16265	16279	16293	16307	16321	16335	16349	16363	16377	16391	16405	16419	16433	16447	16461	16475	16489	16503	16517	16531	16545	16559	16573	16587	16601	16615	16629	16643	16657	16671	16685	16699	16713	16727	16741	16755	16769	16783	16797	16811	16825	16839	16853	16867	16881	16895	16909	16923	16937	16951	16965	16979	16993	17007	17021	17035	17049	17063	17077	17091	17105	17119	17133	17147	17161	17175	17189	17203	17217	17231	17245	17259	17273	17287	17301	17315	17329	17343	17357	17371	17385	17399	17413	17427	17441	17455	17469	17483	17497	17511	17525	17539	17553	17567	17581	17595	17609	17623	17637	17651	17665	17679	17693	17707	17721	17735	17749	17763	17777	17791	17805	17819	17833	17847	17861	17875	17889	17903	17917	17931	17945	17959	17973	17987	17999	18011	18025	18039	18053	18067	18081	18095	18109	18123	18137	18151	18165	18179	18193	18207	18221	18235	18
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by tang D. 1098
 ig 2123
 co 9.7877
 di 9.8975
 tan(y-2) 9.2366
 sec(y-2) 0064

ly S	8.8337	g st	lyg ^s	8894	lyht.	3312
ly T	9.0362	.				
ly w	9.9250	.		gha	1.1925	
ly z	9.5975	.				
ly a	9.5950	.		ly u	9.9250	
ly l	1.00226	.		z ^o	1.0921	
z ^l a	1.00206	.		ly b	0.5181	
				ly w	330	

$$\begin{array}{r}
 -6a = -330 - 330 \\
 -6e = 1004 + 1049 \\
 \quad \quad 14738 - 4738 \\
 -20117
 \end{array}$$

α	$-g \sin(\theta + \alpha) - h \sin(\theta + \alpha)$	Sum	$74^\circ - \epsilon$	κ
$22^\circ 30'$	-312.4	-606	-152.423	156.156
$23^\circ W$	212.3	869	438	5480
$23^\circ 30'$	118.4	1118	553	4557
$24^\circ W$	174	1347	468	3985
$0^\circ 30'$	$+83.9$	1353	483	3189
$1^\circ W$	$+183.4$	1533	498	2393

- gas 6/14 - 12/14/14 Sun
+ 22.65 - 14.94 + 1 7.71 - 2 1.17 - 5346 2.11

1 2773 -9.18 1 18.55 - 4262
40.64 .198

α 1420 ~~45~~ 41 $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$
 22 41 4.98 41 250 22 41 45 340 26 9.52492 9.97407
 50 20 41.3 +5.7 32 50 26 1.64466 1.82075
 22 42 2896 1.25245 1.79992
 141.37 14420
 132398 11

42 3394 42 22 43 16 340 49 9.51666 9.97023 14.844 10 236 50 31 04.9
 50 8 57.4 51 50 14 07978 11 17.42 12.3

22 56 434 43 22 58 27 344 22 9.43092 9.98327 13.763 10 368 51 631.0
 50 55 542 51 51 01 07189 11 14.69 12.3

23 0 2144 43 23 1 04 345 16 9.40538 9.98548 14.230 10 401 50 56 289
 50 45 488 52 50 51 08931 11 13.77 12.3

1 5114 43 2 34 345 38 9.39467 9.98620 12.912 10 411 50 22 53.6
 50 12 125 52 50 18 08068 11 13.17 12.3

4 5114 44 4 50 346 12 9.37755 9.98728 12.370 10 443
 50 43 21 52 50 48 08879 11 12.3 12.3

5 3436 44 7 05 346 46 9.35968 9.98864 12.3 10 443 50 51 153
 6 2148 52 50 46 08802 12.3 12.3

23 15 2770 45 23 16 19 349 3 9.27164 9.35893 -10.08 1 30.29 $\frac{da}{dt}$ $\frac{da}{dt}$ $\frac{da}{dt}$
 50 10 544 53 50 16 08029 9.99202 10 498
 16 57.88 50 21 47.2

17 3997 45 18 25 349 36 9.25612 9.33604 -9.57 1 31.80 9.99281 10 510
 50 7 478 53 50 13 07952 9.99436 10 583
 19 11.74 50 5 20.0

22 2589 46 23 12 350 48 9.20380 9.25999 840 1 32.94 9.99488 10 541
 49 54 264 53 50 00 07619 9.99539 10 549
 23 58.86 50 8 48.2

24 788 46 24 34 351 13 9.18383 9.26464 812 1 33.25
 50 13 197 53 50 18 08081 9.99539 10 549
 25 41.13 50 8 48.2

25 5816 46 26 39 351 40 9.16116 9.23812 763 1 33.74
 49 57 033 53 50 03 07696 9.99539 10 549
 27 26.90 50 8 48.2

+7.4
 +1.5
 +6.6
 +3.6
 +0.3
 +0.7
 +2.6
 +1.7
 +1.0

Reduction of Argelanders observations 1842.0 to 1875.0

$$T - T' = 33 \quad \frac{T - T'}{2} = 16.5 \quad \text{Middle date} = 1858.5$$

$$m_{1858.5} = 46.0780 = 3.07194$$

$$n = 20.0557 = 1.33705$$

$$\log \tan 50^\circ = 0.7619$$

$$\log 44.121 = 1.64465$$

$$1.72089$$

$$\frac{d\mu}{dt} = (3.07194)5 + 5 \times 1.33705 \sin a \tan \mu$$

$$\frac{d\alpha}{dt} = (m(1858.5) + n \sin a \tan \mu) 33 \quad \frac{d\alpha}{dt} = 1^m 41.873 + 44.121 \sin a \tan \mu$$

$$\frac{d\delta}{dt} = (n(1858.5) \cos a \mu) 33$$

$$\frac{d\delta}{dt} = 66.83 \cos a \mu$$

a	μ	a	μ	$\sin a$	$\cos a$	$\mu \sin a$	$\mu \cos a$	$\frac{d\alpha}{dt}$	$\frac{d\delta}{dt}$
0	0	22	30	337 30	9.58284	9.96162	20.120	4.56	
0	10		40						
0	20		50						
1	0	23	0	345 00	9.41300	9.98494	20.120	4.56	
1	10		10						
1	20		20	352 30	9.11570	9.99627	15.55		
1	30		30						
1	40		40						
1	50		50						
2	0	24	00	0 00	0	0	10.0000		
2	10		10						
2	20		20						
2	30	1	30	7 30	9.11570	9.9963			
2	40		40						
2	50		50						
3	0	1	00	15 00	9.41300	9.98494			
3	10		10						
3	20		20						
3	30		30	22 30	9.58284	9.96562			
3	40		40						
3	50		50						
4	0	2	00	36 00	9.6880	9.9375			
4	10		10						
4	20		20						
4	30		30	37 30	9.7844	9.8995			
4	40		40						
4	50		50						
5	0	3	00	45 00	9.8495	9.8495			
5	10		10						
5	20		20						
5	30		30	52 30	9.8995	9.7844			
5	40		40						
5	50		50						
6	0	4	00	60 00	9.9375	9.6990			
6	10		10						
6	20		20						
6	30		30	67 30	9.9656	9.5828			
6	40		40						
6	50		50						
7	0	5	00	75 00	9.9849	9.4130			
7	10		10						
7	20		20						
7	30		30	82 30	9.9656	9.1857			
7	40		40						
7	50		50						
8	0	6	00	90 00	10.0000	0			

Formulae

$$(33) \frac{da}{dt} = 3.0719 + 1.3370 \log(33)$$

$$(33) \frac{dN}{dt} = 20.6555 \cos \omega(33) = 66.1838 \cos \omega$$

$$\frac{da}{dt} = (2.29755 + \log(33)) / 1.33705$$

$$33 \left(\frac{da}{dt} \right) = (2.29755 + \log(33)) 44.1226$$

$$\log 307194 \quad 0.4874124$$

$$\log 1.33705 \quad .1261477$$

$$\log 33 \quad .5185139$$

$$1.8792789$$

$$\log \frac{1}{1.33705} = 9.8738723$$

$$\log 33 \quad 1.5185139$$

$$1.3223662$$

$$\log 1.33705 = 1.1261477$$

$$\log 33 \quad 1.5185139$$

$$1.6446616$$

$\frac{da}{dt}$ and $\frac{d\delta}{dt}$ for 1845.0

$$m = 46.0837 = 3.07225$$

$$n = 20.0542 = 1.33695$$

$$\frac{da}{dt} = 3.07225 + 1.33695 \sin a \tan \delta$$

$$\frac{d\delta}{dt} = 20.0542 \cos a$$

$$\log 1.33695 = 0.12615$$

$$\log \tan 50^\circ = 0.618$$

$$\log \tan 51^\circ = 0.613$$

$$\frac{0.12615 - 0.613}{2.0239} = \frac{0.48685}{2.0239} = 0.2405$$

$$\log 1.33695 = 0.12615$$

$$\log \tan 51^\circ = 0.613$$

$$\frac{0.12615 - 0.613}{2.0239} = \frac{0.48685}{2.0239} = 0.2405$$

a	a_0	$\sin a$	$\cos a$	$\frac{da}{dt}$	$\frac{d\delta}{dt}$
22 00	327 30	9.58284	9.96562	57120	6318
22 32					
23 34	340 00				
23 35					
23 36					
23 37					
23 38					
23 39					
23 40	340 00	9.53405	9.97299	5462	5647
23 41					
23 42					
23 43					
23 44					
23 45					
23 46					
23 47					
23 48					
23 49					
23 50	342 30	9.47814	9.97942	4803	4960
23 51					
23 52					
23 53					
23 54					
23 55					
23 56					
23 57					
23 58					
23 59					
23 00	345 00	9.41302	9.98484	4134	4273
23 01					
23 02					
23 03					
23 04					
23 05					
23 06					
23 07					
23 08					
23 09					
23 10	347 30	9.33534	9.98908	3457	3574
23 11					
23 12					
23 13					
23 14					
23 15					
23 16					
23 17					
23 18					
23 19					
23 20	350 00	9.23967	9.99335	2774	2867
23 21					
23 22					
23 23					
23 24					
23 25					
23 26					
23 27					
23 28					
23 29					
23 30	352 30	9.10770	9.99627	2085	2155
23 31					
23 32					
23 33					
23 34					
23 35					
23 36					

Secular Variations

$$\frac{d^2a}{dt^2} = .0284 + .1950 \left[\tan^2 \delta + \frac{1}{2} \right] \sin 2a + .4481 \sin(2a + 91^\circ 6')$$

$$\frac{d^2\delta}{dt^2} = -.1950 \tan \delta \sin^2 a + .4481 \cos(2a + 91^\circ 6')$$

$$\text{by } \tan \delta = 50^\circ \quad .07619$$

$$\text{by } \tan \delta = 15238$$

$$\tan \delta = 1.420$$

$$\left(\frac{1}{2} + \tan^2 \delta \right) = 1.920$$

$$\text{by } 1.920 = .2833$$

$$\text{by } 1950 = 9.2900$$

$$\text{by } \frac{1}{2} \sin 2a = 9.5733$$

$$\text{by } \tan \delta = 55^\circ \quad .15477$$

$$.30954$$

$$2040$$

$$2540$$

$$0.4098$$

$$9.2900$$

$$9.6948$$

$$\text{by } \tan \delta = 50^\circ \quad .07619$$

$$.30954$$

$$2040$$

$$2540$$

$$0.4098$$

$$9.2900$$

$$9.6948$$

a	$a + 91^\circ 6'$	$\sin(a + 91^\circ 6')$	$\cos(a + 91^\circ 6')$	$2a$	$\sin 2a$	$\cos 2a$	$\sin^2 a$	$\cos^2 a$	$\sin^2 a$
0	91	10.0000	8.2706	0	0.0000	1.0000	0.0000	1.0000	0.0000
1	106	9.9826	9.4430	30	9.6880	9.6880	9.4130	8.8260	9.3980
2	121	9.9326	9.7137	60	9.5375	9.6880	9.4130	8.8260	9.3980
3	136	9.8410	9.8577	90	10.0000	9.6880	9.4130	8.8260	9.3980
4	151	9.6842	9.9423	120	9.8375	9.6880	9.4130	8.8260	9.3980
5	166	9.2826	9.9847	150	9.6880	9.6880	9.4130	8.8260	9.3980
6	181	0	10.0000	180	0	10.0000	10.0000	10.0000	10.0000

a	$a + 91^\circ 6'$	$\sin(a + 91^\circ 6')$	$\cos(a + 91^\circ 6')$	$2a$	$\sin 2a$	$\cos 2a$	$\sin^2 a$	$\cos^2 a$	$\sin^2 a$
0	91	10.0000	8.2706	0	0.0000	1.0000	0.0000	1.0000	0.0000
1	106	9.9826	9.4430	30	9.6880	9.6880	9.4130	8.8260	9.3980
2	121	9.9326	9.7137	60	9.5375	9.6880	9.4130	8.8260	9.3980
3	136	9.8410	9.8577	90	10.0000	9.6880	9.4130	8.8260	9.3980
4	151	9.6842	9.9423	120	9.8375	9.6880	9.4130	8.8260	9.3980
5	166	9.2826	9.9847	150	9.6880	9.6880	9.4130	8.8260	9.3980
6	181	0	10.0000	180	0	10.0000	10.0000	10.0000	10.0000

a	$a + 91^\circ 6'$	$\sin(a + 91^\circ 6')$	$\cos(a + 91^\circ 6')$
0	91	10.0000	8.2706
1	106	9.9826	9.4430
2	121	9.9326	9.7137
3	136	9.8410	9.8577
4	151	9.6842	9.9423
5	166	9.2826	9.9847
6	181	0	10.0000

$$p = 46.084$$

$$p' = 20.054$$

$$AP = p \sin 1^\circ p' \sin 1^\circ \sin 1^\circ \sin 1^\circ$$

$$1 \quad .1872 \quad 5092 \quad 7288$$

$$2 \quad .3242 \quad 4540 \quad .8066$$

$$3 \quad .3744 \quad 3675 \quad 7693$$

$$4 \quad .3242 \quad 2562 \quad 6098$$

$$5 \quad .1872 \quad .1273 \quad 3455$$

$$6 \quad .0000 \quad .0000 \quad .0284$$

$$a = 0^\circ$$

$$a = 1^\circ$$

$$\begin{aligned} & p = 1.6635 \quad \text{Ch } 15 \quad 8.8209 \\ & p' = 14.6856 \quad \text{Ch } 1^\circ \quad 4.6856 \\ & p = 1.3022 \quad \text{Ch } a \quad 0.0000 \\ & p' = 0.762 \quad \text{Ch } p' \quad 0.0000 \\ & \quad \quad \quad 7.7275 \end{aligned}$$

$$.00534$$

$$p = 52494$$

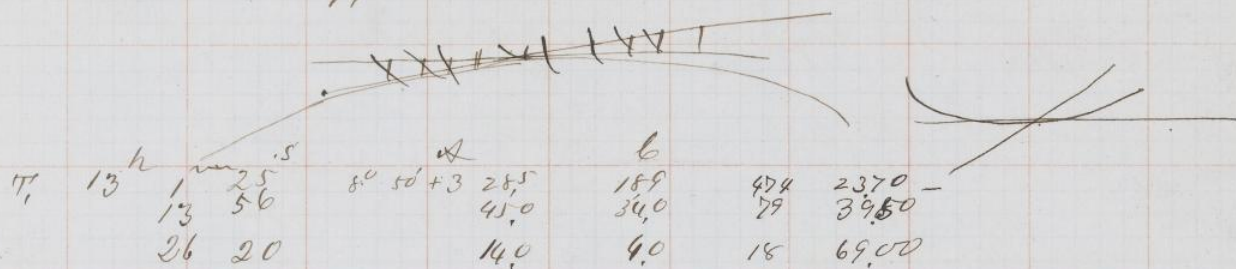
$$p' = 19.371$$

$$\begin{aligned} & 1.7201 \quad \text{Ch } 15 \quad 8.8209 \\ & 4.6856 \quad \text{Ch } 1^\circ \quad 4.6856 \\ & 1.3022 \quad \text{Ch } a \quad 0.0000 \\ & .0762 \quad \text{Ch } p' \quad 0.0000 \\ & \quad \quad \quad 7.7690 \end{aligned}$$

$$\begin{aligned} & .005880 \\ & .001180 \\ & .5959 \\ & 7060 \\ & 7258 \\ & .0198 \end{aligned}$$

$$\begin{aligned} & 5340 \\ & 5384 \\ & 220 \end{aligned}$$

Inclination of horizontal wire for Polaris S.P.
apparent curve



$$1231 = 757$$

$$16.5 \quad 15.1$$

$$116$$

$$15.80 + 738 \quad 19.47 \quad 23.18$$

$$1224 = 744$$

$$29.0 \quad 30.0$$

$$29.5 - 7.24 \quad 25.88 \quad 22.26$$

$$8751 = 2,87564 \quad 5,75128$$

$$8744 = 2,87157 \quad 5,74314$$

$$788 \quad 724$$

$$\begin{array}{r} 8751 \quad 2.87564 \\ 875 \quad 1.17609 \\ \hline 4.05173 \\ 8.38005 \\ \hline 2.43178 \\ 1.36511 \\ \hline 8.93333 \end{array}$$

$$454$$

$$\begin{array}{r} 8744 \quad 2.87157 \\ 874 \quad 1.17609 \\ \hline 4.04766 \\ 8.38005 \\ \hline 2.42771 \\ 1.34753 \\ \hline 8.91982 \end{array}$$

$$4.45$$

$R_{1836 \text{ to } 1875}$ R_{number}
 $m \quad 1555.5 = 46.0781 = 3.04187 \log 0.4879028$
 $n \quad " = 20.1560 = 1.33707 \log i. 1261542$
 $\frac{d\theta}{dr} = 1^{m} 59.803 + 1.71722 \sin a_{\text{true}} \sin$
 $\frac{d\theta}{dr} = 2.8933089 \cos a_m$

From 1810 to 1875

m 1842.5 = 46.0749 = 3.07162 log .4873675
m " = 20.0579 1.33414 " i. 1261769
j. 3022681

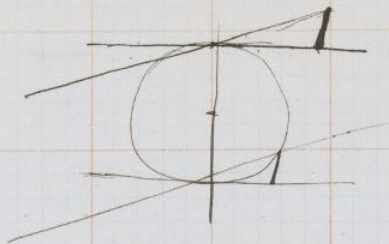
65 da = 3^m 19.655 + 1.93909 sin m tang m
65 dα = 3.1151815 cos α_m

examined

From 1800 to 1845 Galande,
 $n \ 1837.5 = 46.0730 = 3.07154 \log 4873561$
 $n \ .11 = 20.0575 = 1.33717 \quad \begin{matrix} .1261867 \\ 1.3022769 \end{matrix}$
 $75 \frac{da}{dt} = 3 \overset{m}{50} \overset{s}{366} + 2.0426 \sin_m \tan_m \Delta$
 $75 \frac{ds}{dt} \quad 3.1773382 \cos_m$

1842 to 1875 *Argelander*
 $m 18.58.5 = 3.07192$ $\log .4874098$
 $n 11 \rightarrow 26^{\circ} 05' 58'' - 1.33705$ $.1261477$
 1.3022401
 $33d_{gr} = 1.41374 + 1.644668$ in T_{gr}
 $33d_{clt} = 2.8207540$ cor_{clt}

1855 to 1875
 m 1865 46.080802 2.09205 $\log 484283$
 n 11 20.0551 1.33701 $.1261346$
 $20 da = 1^{m} 01.441 + 1.42716 da_{m15m}$
 $20 da$ 2.60325 da_{m}



1 11 364 1 11 364
0 54 420 10 310

8344 13 544
2,92137 3 15
5,84374 13 30
4,81561 3 28 36
6,5935 0 57 42
4,55 1 10 31
12 49 = 769

1 54 654
1,8558
377116
4,81561
8,88677
04

3 46 20
- 9 18
41,65
33,46
8,19

5,84374 3,77116
5,11664 5,11664
9,6038 8,88780
913 .08

50,75
33,54
17,21

3 55,33
33,58
21,75

3 33,50
- 1,08
33,46

2,44207
1,33746
8,89539
4° 30'

71031

5 = 88 37 31
8,99987
8,38005
9,68554
3,06549
1,75012
4,81561

87,5 87506
8,112 175012

4769 = 2,88593
8,38005
1,26598
84 1,17608
2,49207
8819 9,1328
85x 8,47121

3 50,8 41,6 824 46,20
38,3 277 670 33,50

2,49207
1,23578
8,79371

3,06549
9,68897
2,35218
5,11664
2,76446
2,35218
5,11664

13 12 2,3
14 54,0
30 4,0
57 39,5

4,13513
3,85458
1,43024
2,51518
2,21463
1,17955

9150,6 442
96492

2 51,7 16,1 1,206826 .39 3 50,8 41,4 822 46,0 45,71
18 1,7 637,8 2,804684 1530 4 330 230 560 28,0 12,7 26,93
25 372 1287,4 3,109713 3088 4 640 534 1174 5870 27,82/512
42,11

15 10 = 910 2,95904 4,13513 3,85329
7 35,5 49,5 2,65849 43,024 1,17953
70489 1,67569

2,650433
1,62439
8,93396

22 45,5
60
1320,5 13655

8,38005
8,38005
9,134292
1,176091 2690433

454

2 36
4 21

$$RL = 883730$$

$$w/17715$$

$$m \approx 8.68104$$

$T_m - T_{\text{true}}$	m	$\log m$	R					
13 444 = 8244	3705	2.56849	1778943	33.50	3 46.20	3 55.09	8.35005	
9 284 5684	1761	2.24576	845422	36.90	4430	48.52	1.77609	
7 156 4356	1034	2.01452	496248	39.85	4220	44.68	9.55619	
5 369 8369	619	1.79169	297158	42.20	3385	41.38		
3 466 2266	281	1.44871	13567	44.30	3670	37.57		
1 054 654	23	0.36173	11.05	46.20	350	33.55		

4 16.0 136.0	2.37291	3.54900	0.81757	6.57	8.88852	4 25.25
6 28.8 388.8	2.58973	3.76582	2.14587	1.07745	10.41	87158 15 18
8 7.5 487.5	2.68797	3.86406	2.24441	1.13862	13.76	89451 29 5
9 57.8 597.8	2.77656	3.95265	2.33290	1.24353	17.52	91083 39 21
12 39.0 719.0	2.88074	4.05633	2.43638	1.33325	21.54	89687 30 33
						139 42
						4 27 54

2 128 1328	2.12320	3.29925	1.67934	58433	3.84	90499	43631
3 51.5 2315	2.36455	3.54064	1.92069	85673	7.19	93604	45559
5 41.8 3418	2.53377	3.70986	2.08393	1.08941	10.95	94948	46510
8 230 583.0	2.70157	3.87766	2.25771	1.17522	14.97	91751	44440
						202 20	
						4 50 35	

1 387 987	1.99432	1.55046	52504	13.74	97458
3 29.0 709.0	2.32015	1.87629	85787	7.11	97558
6 10.2 370.2	2.56844	2.12458	1.04650	11.13	92192

5 hrs Min.

Tm 14 27 49.6

14 24 10.0

14 26 49.3

3 39.6 2630 1.41996 1.213

1 0.3 1.98 28667 .91

41.70 + 12.13 53.83

0.48 + .91 1.39

52.47

2 39.3 159.3

2.2222 2.20222

1.72415 55158

3.32637 2.75380

1.71991 1.71991

8.96611

14 27 49.6

31 47.8

29 0.0

3 58.2

1 10.4

23.10 - 12.5

1 28.10 - 14.28 21.85

Σ = 76 15.58

Σ 152 31.56

Σ 221 9.66400

cos 0.84406 9.37540

1.17609 1.17609

1.12415 0.55158

30.96 1.48080 14.28

2.70 0.43136 1.25

2 47.8 167.8

2.22479 2.22479

1.71575 55158

2.77637 2.77637

1.71575

8.93938

4.58

5.19

10.17

5.08

Reading of circle of intersection =
 Reading of circle of a

$T_m - T_a = 12.40$
 6.20
 186.00
 82412

By 2.26951

1.15768

~~88713~~

9.11287

8.88217

4° 21' 35"

A 2 58.08 49.18

3 11.89 03.74

23.75 24.17

13.81 23.75

24.72

14.56

13.81

8.37

14.18

52

~~32.0~~
32.0

52	32.0	1.2	2	1.9	(1/2)	53	26.5	3	3)	54.0	46.2	1006	50.30
				10.8		56	14.6			55.6	46.0	996	49.80
				19.1		59	31.2			54.0	44.8	988	49.40
1	2	106				50	39.2			53.4	45.6	990	49.60
	3	54.5				2	45.3			50.0	41.8	918	45.90
	5	37.6	3	45.2		4	14.0			50.4	41.0	914	45.70
	7	19.1		54.3		6	16.0			47.2	38.4	859	42.95
	10	44.9		55.8		7	54.2			46.5	37.5	840	42.00
	13	58.4		2.8		9	27.2			42.4	35.0	774	38.70
	17	35.4											
	19	22.6	55	34.7		12	5.0			37.3	30.4	680	34.0
	~~96~~	~~58.8~~	538	36.7		13	13.8			36.2	27.4	636	31.80
	10	46.00		41.4		14	49.0			32.3	24.3	566	28.80
	27	59.2				16	24.0			30.2	22.4	524	26.80
						17	57.0			27.0	17.5	445	22.5
10	46.0		7	12.7		19	41.1			21.8	13.0	348	17.40
11	44.8			17.0		21	6.4			19.9	11.0	309	15.40
	40.8			22.5		22	6.5			15.7	7.7	234	11.70
	30.5					23	29.5			14.1	5.4	198	9.90
11						24	45.0			8.4	-0.4	5	4.00
						25	58.6			4.3	56.4	1207	0.03
						26	42.0			2.2	53.4	1156	57.60
14	4.0		10	36.1		28	15.2			57.5	49.2	1067	53.20
	11.2			44.8									
	17.0			54.0									
	32.2												
	10.7												
17	31.0		15	53.9									
	36.0			53.7									
	40.3			58.7									
				5.3									
			19	17.0									
				22.0									
				28.7									
			27	48.6									
				58.2									
				10.7									

@ Sel-01-3644

35.58

86

34

344

172

2064

86

7.066

4156

107

29092

4156

444652

m2✓ 8.68104

599	18 195	2.81889	18 29	637.32	80572	8073	5030	19.57
314	15 314	2.67390	15 148	45627	65922	2189	4980	27.91
248	12 148	2.46902	11 582	28128	44919	1849	4940	35.91
6668	11 68	2.38464	10 502	23054	36275	1106	4980	38.84
4809	8 09	2.09974	8 441	14910	17552	799	4190	38.71
3920	6 320	1.92327	7 114	10336	01435	496	4170	40.74
2700	4 300	1.59945	5 134	5360	72916	257	4295	40.38
1718	2 578	1.20676	3 352	2526	140243	121	4200	40.79
788	1 188	0.52977	2 22	817	91222	39	3870	38.31

+	1 180	53198	0 345	9.83780	04	34002	34.04
	2 276	1.07610	1 433	0.76490	28	3150	32.08
	4 30	1.50793	3 185	1.83226	103	2880	29.83
	5 380	1.79454	4 535	1.67190	225	2645	28.70
	7 180	2.00967	6 285	1.91325	393	2225	26.18
	8 551	2.19351	8 106	2.11800	630	1740	23.70
	10 204	2.32200	9 359	2.25757	868	1145	24.13
	11 205	2.41230	10 360	3.4357	1059	1150	22.29
	12 435	2.50227	11 590	4.5009	1353	9.80	23.43
	13 590	2.58412	13 145	5.3680	1651	4.00	20.51
	15 46	2.64948	14 201	6.0570	1936	0.03	19.39
	15 560	2.69747	15 115	6.5610	2173	5780	19.53
	17 292	2.77825	16 447	7.4060	2640	53.05	19.75

$$\begin{array}{r} 3404 \\ 1975 \\ \hline 1429 \end{array}$$

$$\begin{array}{r} 1957 \\ 3831 \\ \hline 1874 \end{array}$$

$$\begin{array}{r} 16 \quad 102 \\ \hline 60 \\ 960 \\ 9702 \end{array}$$

$$\begin{array}{r} 17 \quad 07 \\ \hline 102 \end{array}$$

$$\begin{array}{r} 2.98686 \\ 1.17609 \\ 8.38005 \\ \hline 2.54300 \\ 1. \end{array}$$

$$\begin{array}{r} 1027 \\ 3.01157 \\ 1.17609 \\ 8.38005 \\ \hline 2.66771 \end{array}$$

3 Cons

2.169

142.8

1369

1025

2.13640

9.77761

1.18609

3.09010

B. 01199 892189 0"

446

Polars Daily

0 45-223
253
285 164 45-255

53 594
624
640 1858 54 1.9

2 357
391
440 1182 2 39.4

4 213
260
305 778 4 25.9

6 47
81
120 258 6 8.6

7 470
512
562 1544 7 51.5

11 134
164
201 499 11 16.7

14 392
420
460 1272 14 42.4

16 196
240
287 728 16 24.1

18 49
88
106 223 18 7.4

19 485
521
565 1571 19 52.4

28 268
296
330 894 28 29.8

37 25
57
94 17.6 37 5.6

25

Interval for - 15+1 57 401

" " - 25+2 45 255
34 279

$T_m - T_1$ 25 51.1 = 155.1 $T_2 - T_1$ 17 14.7 1034.7
 $T_m - T_2$ 25 49.0 = 154.0 $T_2 - T_2$ 17 13.2 1033.2

$\log 13/9064$ 15005 301481 .01418

$\cos 8.37996$ 8.37996 8.37996 8.37996

$\log 9.99908$ 99908 9.99958 9.99958

1.56968 1.56909 1.39435 1.38372

1.17609 1.17609 1.17609 1.17609

2.74577 2.74528 2.57044 2.56581

556.90 871.91

556.24 371.37

117 128

556.58 371.64

$\log 2.74552$ 2.57012
0.30103
8 04656

4 40
1 320 013

321 309

302 211

303 303

310 303

1 312 1 316

3085 9085

2.74552

96094

304656

1.96882

8.91432 = 4° 41' 40"

891176

39 57

$\angle = 88^\circ 37' 32''$

$\cos \angle 8.37996$

17 14.7 1034.7

17 13.2 1033.2

430

430

446

109

436

25

3082

30.88

43517

3803

3758

2338

43753

$$\begin{array}{r}
 2741-77 \quad 2741-28 \\
 117609 \quad 117609 \\
 392186 \quad 392137 \\
 65341 \quad 65341
 \end{array}$$

$$\begin{array}{r}
 2741-77 \quad 2741-28 \\
 65341 \quad 64581 \\
 2,90764 \quad 8,90053 \\
 2,741-77 \quad 2,741-28 \\
 65341 \quad 65321 \\
 8,90645 \quad 8,90793
 \end{array}$$

$$\begin{array}{r}
 392186 \\
 65244
 \end{array}$$

$$\begin{array}{r}
 2741-77 \\
 65244
 \end{array}$$

$$\begin{array}{r}
 2,90764 \\
 2,90667
 \end{array}$$

$$\begin{array}{r}
 2,741-28 \\
 65243
 \end{array}$$

$$\begin{array}{r}
 7009 \\
 2,90715
 \end{array}$$

$$\begin{array}{r}
 2,57044
 \end{array}$$

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$$\begin{array}{r}
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 47012 \\
 8,89968
 \end{array}$$

$$\begin{array}{r}
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 47188 \\
 8,90144
 \end{array}$$

$$\begin{array}{r}
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 3635 \\
 8250 \\
 3730 \\
 2484
 \end{array}$$

$$\begin{array}{r}
 43603 \\
 3788 \\
 1341
 \end{array}$$

$$\begin{array}{r}
 43650
 \end{array}$$

$$\begin{array}{r}
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 47972 \\
 8,89991
 \end{array}$$

$$\begin{array}{r}
 2,56981 \\
 48555 \\
 8,91874
 \end{array}$$

$$\begin{array}{r}
 43218 \\
 3324 \\
 3845 \\
 4526 \\
 14953
 \end{array}$$

$$\begin{array}{r}
 43738
 \end{array}$$

$$\begin{array}{r}
 556.0
 \end{array}$$

$$\begin{array}{r}
 30103 \\
 74807 \\
 95182
 \end{array}$$

$$\begin{array}{r}
 43756 \\
 4366 \\
 43628 \\
 2030
 \end{array}$$

$$\begin{array}{r}
 43650 \\
 4370
 \end{array}$$

080
08191028
2,47712
8,19055738740
80807
38269
808072440
241419547 1568
19076 155216
5"

1875phae, Apr 1, 1745.