1849phae.proj...271

KG
113605
271

M.24

Reduction of
Moon Culminations
from Jan. 1849
to
A.

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See Red ink for T. Book 1848 Nov.
T. H. S.

NB Get out list of pairs from the observations previous to June 1st 1849
Write at the head of each sheet of your work the subject
in one ~~grouped~~ combined result
& state No of obs for each result

Use our values for 1849 to 1852 as given on 1st page of Transit Book for "Jan to June 1852." for reducing defective transits & the tables there given for defective Moon Transits

1st Step after defective wire, is to find Clock rate & apply its correction

NB for the present compute only between 1848 upto 1849 July 30
After that date some of the obs are already reduced in Chron Exp.

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$$\Sigma(\cos\delta^2) = q \qquad q = \Sigma(\tan\delta^2)$$
$$\Sigma(\sin\delta\cos\delta) = q' \qquad q' = \Sigma(\sin\delta\cos\delta)$$
$$q'' = \Sigma(\sin\delta^2)$$

$$0 = q + qx + q'y$$
$$0 = q' + q'x + q''y$$
$$0 = qq' + qq'x + q'q'y$$
$$0 = q'q + qq'x + qq''y$$

$$\frac{(q'q - qq')}{q'q' - qq''} = y$$
$$\frac{qq'' - q'q'}{q'q'' - q'q'} = x$$

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13.94 27.87 41.82
— — —
13.95 27.84 41.79
14.00 28.00 42.00

45.57

31.2
34.2
94.1
145.5

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The want of Level & Collimation observations immediately after the mounting of the Transit Circle up to July 30th 1849 makes it advisable to adopt the following method of reduction. from Jan 1st 1849 to July 30th 1849

1st Correct imperfect transits to mean of 7 wires. using the following intervals which have been found from observations of transits of Polaris from 1849 to 1852 & which give a distance of the mean of the 7 wires from the mid wire the same as given by observations in 1848-49 (See Chron. Exped.)

The East

| | | |
|---|---|---|
| A to mean of 7 wires | | − 41.$^s$142 |
| B | " | 27.474 |
| C | " | 13.758 |
| D | " | − 0.045 |
| E | " | + 13.726 |
| F | " | 27.431 |
| G | " | + 41.263 |

For methods of reduction for Moon's imperfect transits See Transit Book Jan to June 1852.

2nd Correct mean of wires for rate & call it t

3rd Find for all the Stars including the Moon culminations the differences $m = (t - AR) - m_0$

$m_0$ being very nearly the Clock error at the time constant for all the stars.

4th Find $m' = m \cos \delta$

5th Form the following Equations

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$$0 = m_1' + x \cos\delta_1 + y \sin\delta_1 \quad \text{for } *_1$$
$$0 = m_2' + x \cos\delta_2 + y \sin\delta_2 \quad " \quad *_2$$
$$\alpha_1 \qquad \alpha_1$$

There are already reduced nearly to a common measure of exactness. α if the stars are compared within an arc of 60° α the illuminated end of the axis remains in the same position the method is more accurate than observation (See Chron. Exp.)

Solve the Equations by Least Squares. Having thus determined x α y. we shall have for the corrected R of each star making $x' = x + m$.

$$R = t + x' + y \tan\delta.$$

We have included - Clock error. azimuth. level - collimation. rate - reduction to same exactness - and partially the figure of the pivots -

---

1. From July 30th 1849 to Feb 27th 1850 and from July 19th 1851 To Jan 2nd 1852 The values of a b α c are the same as those adopted in the reduction of the Chronometric Expeditions of those years.

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4.
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| Star's Name | δ | ν cm²δ Log sin. | β sin δ cm²δ Log cos | ζ cm²δ Log cos | μ m cm δ | n m sin δ |
|---|---|---|---|---|---|---|
| ν Piscium | + 4 43 | .993 | .082 | .007 | + .228 | + .019 |
| α Arietis | + 22 45 | .357 1850 | .357 | .150 | − .195 | − .082 |
| ξ² Ceti | + 7 47 | .982 | .134 | .018 | − .069 | − .009 |
| γ Ceti | + 2 36 | .998 | .045 | .002 | − .140 | − .006 |
| BAC 845 | + 9 28 | .973 | .162 | .027 | − .088 | − .015 |
| α Ceti | + 3 30 | .996 | .081 | .004 | − .189 | − .012 |
| | | 5.792 | .841 | .208 | − .453 | − .105 |

| | | | |
|---|---|---|---|
| fδ | − .381 | δδ − αε | + .006 |
| αε | − .094 | αδ − βγ | + .227 |
| βγ | − .088 .608 | γδ − δ² | + .695 |
| βδ | − .088 | x | + .01 |
| γε | 1.205 | y | + .46 |
| δ² | .707 | | |

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Jan 3 1849 $t_0 = 1^h\,00^m$ Rate $+1^s.30$ $m_0 = -0^m\,56^s.00$

| | x Piscium | a Arietis | G C. | $\xi^2$ Ceti |
|---|---|---|---|---|
| | 1 34 30.90 | 1 59 36.52 | 2 18 11.29 | 2 21 4.60 |
| rate | −.03 | −.05 | −.07 | −.07 |
| t | 1 34 30.87 | 1 59 36.47 | 2 18 11.22 | 2 21 4.53 |
| t − R | +56.23 | +55.77 | | +55.93 |
| m | +0.23 | −0.23 | | −0.07 |
| $x' = x + m_0$ | −55.99 | −55.99 | −55.99 | −55.99 |
| g tan δ | +.04 | +.09 | +.08 | +.06 |
| Obsd R | 1 33 ~~55.95~~ 34.92 | 1 ~~58 40.67~~ 55.66 | 2 17 ~~15.31 55.91~~ | 2 20 ~~8.60 55.93~~ |
| Comp R | 1 33 34.64 | 1 58 40.70 | | 2 20 8.60 |
| C − O | −0.28 | +0.03 | | 0.00 |

| | ζ Ceti | BAC 845- | α Ceti |
|---|---|---|---|
| | 2 36 25.20 | 2 37 43.57 | 2 55 19.87 |
| Rate | −.09 | −.09 | −.10 |
| t | 2 36 25.11 | 2 37 ~~43.48~~ | 2 55 19.77 |
| t − R | +55.86 | +~~55.91~~ | +55.81 |
| m | −0.14 | −0.09 | −0.19 |
| $x + m_0$ | −55.99 | −55.99 | −55.99 |
| g tan δ | +.07 | +.08 | +.03 |
| Obs. R | 2 35 ~~29.14 55.93~~ | 2 ~~36 47.57 55.91~~ | 2 ~~54 23.81 55.96~~ |
| Comp. R | 2 35 29.25 | 2 36 47.57 | 2 54 23.96 |
| C − O | +0.11 | 0.00 | +0.15 |

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8

| | | | S | ε | ω | 3 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ξ Tauri | +9° 12′ | 1 | .974 | .158 | .026 | +.039 | +.006 | αδ | +.038 | γε +.422 |
| λ Tauri | +12 4 | | .956 | .204 | .044 | +.078 | +.016 | αε | +.009 | δ² +.397 |
| α Tauri | +16.12 | | .922 | .268 | .078 | −.055 | −.016 | βγ | +.017 | x −0.20 |
| | | | 2.852 | .630 | .148 | +.060 | +.006 | βδ | +.004 | y +0.84 |

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Jan. 4. 1849 $t_0 = 3^h\,00^m$ Rate $+1^s.60$ $m_0 = -57^s.20$

| | α 1st Leab. | ζ Tauri | λ Tauri | α Tauri |
|---|---|---|---|---|
| | 3. 17. 29.49 | 3. 19. 57.47 | 3. 53. 17.34 | 4. 28. 13.89 |
| Rate | − 0.02 | − 0.02 | − 0.06 | − 0.10 |
| t | 3 17 29.47 | 3 19 59.45 | 3 53 17.28 | 4 28 13.79 |
| t−R | | + 57.24 | + 57.28 | + 57.14 |
| m | | + 0.04 | + 0.08 | − 0.06 |
| x+m₀ | − 57.40 | − 57.40 | − 57.40 | − 57.40 |
| Δ | + 0.18 | + 0.14 | + 0.18 | + 0.34 |
| Obs.R | 3 16 32.25 ~~57.22~~ | 3 19 ~~0.19 57.26~~ | 3 52 20.06 ~~57.22~~ | 4 27 ~~16.23 57.26~~ |
| Comp.R. | | 3 19 0.21 | 3 52 20.00 | 4 27 16.65 |
| C−O | | + 0.02 | − 0.06 | + 0.02 |

374?

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Jan 5. 1849. $t_0$ = 4. 00. Rate. +2.05 $m_0$ = − 61.$^s$00

| | ☉ 1st Limb. | α Tauri | As α Tauri is within 10′ of the same declination as the moon, we and used the corrections for a Fauri for the Moon. |
|---|---|---|---|
| | 4. 19. 41.40 | 4. 28. 17.80 | |
| Corr.R. | | 4 27 10.64 | |
| | 1 1.16 | 1 1.16 | |
| | 4 18 40.24 | | |

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| | | $\gamma$ $\cos^2\delta$ | $\delta$ $\sin\delta\cos\delta$ | $\varepsilon$ $\sin^2\delta$ | $\alpha$ $m\cos^2\delta$ | $\beta$ $m\sin\delta\cos\delta$ | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| $\alpha$ Tauri | $+16^\circ 12'$ | .922 | .268 | .078 | + .110 | + .032 | $\alpha\delta$ | + .017 | $x$ | .00 |
| $\zeta$ Tauri | + 21 3 | .891 | .335 | .129 | + .009 | + .003 | $\alpha\varepsilon$ | + .041 | $y$ | −.24 |
| $\gamma$ Orionis | + 14 47 | .935 | .247 | .065 | + .168 | + .045 | $\beta\gamma$ | + .646 | | |
| $\beta$ Orionis | − 8 23 | .979 | −.144 | .021 | −.167 | + .025 | $\beta\delta$ | + .035 | | |
| $\alpha$ Columbae | −34 10 | .685 | −.465 | .315 | −.062 | + .042 | $\gamma\varepsilon$ | + 2.670 | | |
| | | 4.392 | +241 | ⁂.608 | + .068 | + 147 | $\varepsilon^2$ | .058 | | |

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Jan. 6th, 1849. $t_0 = 4^h\ 00^m$ Rate $= +2^s.16$ $m_0 = -61^s.30$

| | α Tauri | δ Tauri | ζ Tauri | ν Orionis |
|---|---|---|---|---|
| | ~~$4^h\ 28^m\ 18^s.10$~~ | ~~$5^h\ 24^m\ 01^s.87$~~ | $5^h\ 29^m\ 39^s.97$ | $5^h\ 59^m\ 59^s.90$ |
| Rate | − .04 | − .13 | − .13 | − .18 |
| t | 4 28 18.06 | 5 24 6.74 | 5 29 39.84 | 5 59 59.72 |
| t − R | + 1 1.42 | | + 1 1.31 | + 1 1.48 |
| m | + .12 | | + .01 | + .18 |
| $x + m_0$ | − 1 1.30 | − 1 1.30 | − 1 1.30 | − 1 1.30 |
| $y + z + \delta$ | − .07 | − .09 | − .09 | − .06 |
| Obs. R | 4 27 16.69 | 5 23 5.36 | 5 28 38.45 | 5 58 58.36 |
| Comp. R | 4 27 16.64 | | 5 28 38.53 | 5 58 58.24 |
| C − O | − 0.05 | | + 0.08 | − 0.12 |

| | β Orionis | α Columbae |
|---|---|---|
| | $5^h\ 8^m\ 19^s.31$ | $5^h\ 35^m\ 13^s.77$ |
| Rate | − .19 | − .23 |
| t | 5 8 19.12 | 5 35 13.54 |
| t − R | + 1 1.13 | + 1 1.21 |
| m | − .17 | − .09 |
| $x + m_0$ | − 1 1.30 | − 1 1.30 |
| $y + z + \delta$ | + .04 | + .16 |
| Obs. R | 5 7 17.86 | 5 34 12.40 |
| Comp. R | 5 7 17.99 | 5 34 12.33 |
| C − O | + 0.13 | − 0.07 |

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| | | γ | δ | ε | α | β | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $\cos^2\delta$ | $\sin\delta\cos\delta$ | $\sin^2\delta$ | $m\cos^2\delta$ | $m\sin\delta\cos\delta$ | | | |
| γ Ceti | $+2^\circ 36'$ | .998 | +.045 | .002 | −.240 | −.011 | $\alpha\delta$ −.519 | $\gamma^2$ 0.540 | |
| α Ceti | +3 24 | .996 | +.061 | .004 | −.269 | −.016 | $\alpha^2$ −.127 | $\delta^2$ 0.329 | |
| δ Arietis | +19 9 | ~~.974~~ .1892 | ~~+.158~~ +.310 | ~~.026~~ .108 | −.152 | −.053 | $\beta\gamma$ −.459 | $x$ + 0.28 | |
| ξ Tauri | +9 12 | .974 | +.158 | .026 | −.244 | −.039 | $\beta\delta$ −.068 | $y$ − 0.29 | |
| | | 3.860 | +.574 | .140 | −.905 | −.119 | | | |

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Jan. 31. 1849. $t_0 = 3^h 00^m$ Rate = 2.45 $m_0 = -1^m 58^s.00$

| | γ Ceti | α Ceti | 1st N limb. | δ Arietis. |
|---|---|---|---|---|
| | $2^h 37^m 26^s.71$ | $2^h 56^m 21^s.44$ | $2^h 58^m 16^s.86$ | $3^h 04^m 58''.38$ |
| Rate | − 0.06 | − .10 | − .10 | − .11 |
| t | 2 37 26.65 | 2 56 21.34 | 2 58 16.76 | 3 04 58.27 |
| t-R | + 1 57.76 | + 1 57.73 | | + 1 57.83 |
| m | − 0.24 | − 0.27 | | − 0.17 |
| x+m₀ | + 1 57.72 | − 1 57.72 | − 1 57.72 | − 1 57.72 |
| y tan δ | − 0.01 | − 0.02 | − 0.06 | − 0.09 |
| Obs R. | 2 35 28.92 | 2 54 23.60 | 2 56 18.98 | 3 3 0.46 |
| Comp. R. | 2 35 28.89 | 2 54 23.61 | | 3 3 0.44 |
| C−O | − 0.03 | + 0.01 | | − 0.02 |

ξ Tauri

| | |
|---|---|
| | $3^h 20^m 57^s.77$ |
| Rate | − .14 |
| t | 3 20 57.63 |
| t-R | + 1 57.75 |
| m | − 0.25 |
| x+m₀ | + 1 57.72 |
| y tan δ | − 0.05 |
| Obs R. | 3 18 59.86 |
| Comp. R. | 3 18 59.88 |
| C−O | + 0.02 |

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| | δ | +q.δ | γ cos δ² | δ sin cos δ | ε sin² | α mcos δ | β msin δ cos δ | |
|---|---|---|---|---|---|---|---|---|
| ξ Geminorum | +13 3 | .234 | .944 | +.220 | .051 | −.014 | −.004 | αδ +.105 |
| ζ Geminorum | +20 47 | .380 | .874 | .332 | .126 | +.026 | +.010 | αε +.047 |
| δ Geminorum | +22°15 | .409 | .850 | .357 | .150 | +.026 | +.011 | βγ +.036 |
| Castor | +32 13 | .630 | ~~.774~~ .716 | ~~.474~~ .438 | ~~.226~~ .284 | +.086 | +.054 | βδ +.013 |
| Procyon | +5 36 | .068 | .990 | .097 | .010 | +.064 | +.007 | γε +4.36 |
| Pollux | +28 23 | .540 | .774 | +.418 | 226 | −.132 | −.071 | δ2 +3.52 |
| ~~Sum~~ | | | 5.153 | +1.875 | .647 | +.056 | +.007 | |
| Moon | 18 25 | .333 | ~~5.77~~ | | | $x = -0.\overset{\vee}{\wedge}64\,y + 0.08$ | | |

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1940phae.proj.:2435



1849 Mar. 3. $t = 6^h 00^m$ Rate = $3^s.00$ $m_0 = -3^m 13^s.00$

| | ε Geminorum | ν¹ 1st Limb | δ Geminorum | ζ Geminorum |
|---|---|---|---|---|
| | ~~$6^h 40^m 2^s.80$~~ ~~$7^h 14^m 20^s.27$~~ | ~~$6^h 45^m 00^s.97$~~ ~~$7^h 2$~~ | $6^h 58^m 23^s.10$ | $7^h 14^m 20^s.27$ |
| Rate | − .08 | − .09 | − .12 | − .15 |
| $t$ | 6 40 2.72 | 6 44 0.88 | 6 58 22.98 | 7 14 20.12 |
| $t-R$ | +3 12.98 | | +3 13.03 | +3 13.03 |
| $w$ | − 0.02 | | + .03 | + .03 |
| $x+m_0$ | −3 ~~12.96~~ 13.04 | −3 ~~12.96~~ 13.04 | −3 12.96 13.04 | −3 ~~12.96~~ 13.04 |
| $y+y^\delta$ | + 0.02 | + 0.03 | + 0.03 | + 0.03 |
| Obs. $R_1$ | 6 36 ~~49.78~~ 70 | 6 40 ~~47.95~~ 57 | 6 55 ~~10.05~~ 7.97 | 7 11 ~~7.77~~ 11 |
| Comp. $R$ | 6 36 49.74 | | 6 55 9.95 | 7 11 7.09 |
| $C-O$ | + 0.04 | | − 0.02 | − 0.02 |

| | Carlos | Bouyon | Collins |
|---|---|---|---|
| | $7^h 28^m 11^s.81$ | $7^h 34^m 38^s.00$ | $7^h 39^m 18^s.21$ |
| Rate | − .18 | − .20 | − .21 |
| $t$ | 7 28 11.63 | 7 34 37.80 | 7 39 18.05 |
| $t-R$ | +3 13.12 | + 3 13.07 | +3 12.83 |
| $w$ | + ~~.12~~ 0.12 | + .07 | − .17 |
| $x+m_0$ | −3 ~~12.96~~ 13.04 | −3 ~~12.96~~ 13.04 | −3 ~~12.96~~ 13.04 |
| $y+y^\delta$ | + 0.05 | + 0.01 | + 0.04 |
| Obs. $\alpha$ | 7 24 ~~58.72~~ 58.64 | 7 31 ~~24.88~~ 24.77 | 7 36 ~~5.22~~ 5.05 |
| C. $\alpha$ | 7 24 58.57 | 7 31 24.73 | 7 36 5.22 |
| $C-O$ | − 0.13 | − 0.04 | + 0.~~04~~ 17 |

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1849phae.proj...215

| Star Name | δ | tg δ | χ cos δ | ζ sin δ | ε x δ² | α | β |
|---|---|---|---|---|---|---|---|
| δ Geminorum | +22 15 | +.404 | .850 | +.357 | .150 | − .212 | − .089 |
| Auriga | 32 13 | .630 | .716 | .651 | .284 | − .400 | − .063 |
| Rotheg | 28 23 | .540 | .774 | .418 | .226 | − .085 | − .046 |
| 5 Camelop | 16 52 | .303 | .916 | .278 | .084 | − .137 | − .042 |
| 12 Camelop | 14 5 | .251 | .941 | .236 | .059 | − .160 | − .040 |
| Moon | 15 14 | .272 | | | | | |
| α Camelop | + 12 26 | + .221 | .954 | .210 | .046 | − .219 | − .048 |
| | | | 5.151 | 1.950 | .849 | − .913 | − .328 |

βδ −.642 αε −.775
γε 4.373 δ² 3.902
αδ −1.780 βγ −1.689
x + 0.28 y − 0.19

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Mar. 5. 1849. $h = 7^h 10^m$ Rate = + 2$^s$40 $m_0 = -3^h 18^s 00$

| | β Geminorum | Castor | ~~Pollux~~ | Pollux. |
|---|---|---|---|---|
| | $7^h 14^m 24^s 83$ | $7^h 28^m 16^s 39$ | ~~$7^h 39^m 23^s 14$~~ | $7^h 39^m 23^s 17$ |
| Rate | − .02 | .05 | | .07 |
| t | 7 14 24.81 | 7 28 16.34 | | 7 39 23.10 |
| t − α | 3 17.75 | 3 17.86 | | 3 17.89 |
| w | − 0.25 | −0.14 | | − 0.11 |
| x + $m_0$ | − 3 17.72 | −3 17.72 | | − 3 17.72 |
| y tg δ | − 0.08 | − 0.12 | | − 0.10 |
| O. α | 7 11 7.01 | 7 ~~24~~ 58.50 | | 7 36 5.18 |
| C. α | 7 11 7.06 | 7 24 58.48 | | 7 36 5.21 |
| C − O | + .05 | − .02 | | + .03 |

| | δ Canis | 12 Canis | ~~11$^s$ 1$^h$~~ | α Canis |
|---|---|---|---|---|
| | $7^h 56^m 12^s 63$ | $8^h 3^m 34^s 87$ | $8^h 44^m 19^s 86$ | $8^h 53^m 32^s 63$ |
| Rate | − .09 | .11 | .17 | .19 |
| t. | 7 56 12.54 | 8 3 34.76 | 8 44 19.69 | 8 53 32.44 |
| t − α | 3 17.85 | 3 17.83 | | 3 17.77 |
| w | − 0.15 | − 0.17 | | − 0.23 |
| x + $m_0$ | − 3 17.72 | − 3 17.72 | − 3 17.72 | − 3 17.72 |
| y tg δ | − .01 | − .05 | − .05 | − .04 |
| O. α | 7 52 54.71 | 8 0 ~~16~~.94 | 8 41 1.92 | 8 50 14.68 |
| C. α | 7 52 54.69 | 8 0 16.93 | | 8 50 14.67 |
| C − O | − 0.07 | − 0.06 | | − 0.01 |

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the quantity in hour, the wrong sign.

| Star | Name | δ | lg δ | γ cos δ | γ sin δ | ε per δ | α cos δ | β sin δ |
|---|---|---|---|---|---|---|---|---|
| β | Librae | -8°50′ | -.155 | .976 | -.152 | .024 | -.010 | +.002 |
| α | Serpentis | +6 54 | +.121 | .986 | +.119 | .014 | -.168 | -.020 |
| β | Scorpii | -19 23 | -.352 | .890 | -.313 | .110 | +.178 | -.063 |
| δ | Ophiuchi | -3 18 | -.058 | .997 | -.057 | .003 | -.140 | +.008 |
| | | | | 3.849 | -.403 | +.151 | -.140 | -.073 |

| | | | | |
|---|---|---|---|---|
| βδ | +.029 | αε | -.021 | +.008 | $x = +.01$ |
| γε | +.581 | δ² | -.162 | +.143 | $y = +.45$ |
| αδ | +.058 | βγ | -.280 | +.336 | |

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1849phae.proj...2745



July 27. 1849. $t_0 = 15^h 00^m$ Rate $+2^s.50$ $m_0 = \overline{9}.33.00$

| | $\delta^s$ 1$^a$ Lumb. | $\beta$ Libræ | $\alpha$ Serpentis | $\beta$ Scorpii |
|---|---|---|---|---|
| | 15. 5. 50.79 | 15. 18. 28.11 | 15. 46. 25.00 | 16. X. 14.99 |
| Rate | − .01 | − .02 | − .05 | − .07 |
| $t$ | 15 5 50.78 | 15 18 28.09 | 15 46 24.95 | 16. X. 14.92 |
| $t-\alpha$ | | + 9 33.01 | +9 33.17 | +9 32.80 |
| $w$ | | + .01 | + .17 | + .20 |
| $\kappa+m_0$ | + 9 33.01 33.99 | + 9 32.99 3.01 | − 9 32.99 3.01 | − 9 32.99 3.01 |
| $\gamma t \gamma^2$ | + .09 86 | + .07 15 | + .05 1.89 | + .16 2.07 |
| $\alpha.\alpha$ | 14 56 17.70 | 15 8 55.03 | 15 36 52.01 | 15 56 42.77 |
| $C.\alpha$ | | 15. 8. 55.08 | 15. 36. 51.78 | 15. 56. 42.72 |
| $C-O$ | | − .07 | − 0.11 | + 0.05 |

$\delta$ Ophiuchi

| | |
|---|---|
| | 16. 16. 1.46 |
| Rate | − .08 |
| $t$ | 16. 16. 1.38 |
| $t-\alpha$ | + 9 33.14 |
| $w$ | + .14 |
| $\kappa+m_0$ | + 9 32.99 3.01 |
| $\gamma t \gamma^2$ | + .03 |
| $\delta.\alpha$ | 16 6 28.40 |
| $C.\alpha$ | 16. 6. 28.24 |
| $C-O$ | − 0.16 |

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July 30. 1849. $t_0$ = ~~+ 4h 60m~~ Rate =

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26

A number of the following are taken from the Chron. Expedition papers.

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1849phae.proj...2715



July 30. 1849. — $t_0 = 17^h 12^m$ Rate $+2^s.70$ $a = +0.40$ $b = +0.08$ $c = +0.47$

| | η Ophiuchi | 1st Guide. | 58. Ophiuchi. | |
|---|---|---|---|---|
| Mean time | 17 11 27.14 | 17 26 00.41 | 17 44 7.21 | 19? |
| Rate | — .00 | — .05 | — .06 | |
| Hz. | + .35 | + .37 | + .38 | |
| Coll. | + .49 | + .50 | + .51 | |
| Lev. | + .04 | + .04 | + .04 | |
| P. Equat. | .00 | .60 | .00 | |
| | 17 11 28.02 | 17. 36. 1.27 | 17. 44. 8.08 | |
| $2t_0$ | q 42.40 | q 42.40 | q 42.40 | |
| G. C. | 17 1 45.62 | 17 26 18.87 | 17 34 25.68 | |
| C. ~ | 17 1 45.72 | | 17 34 25.65 | |
| C − O | + .10 | | − .03 | |

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1849phae.proj.:2715

Aug. 1. 1849 $t_0 = 15.00$ Rate $+2^s.70$

| | α Coronae | α Serpentis | β¹ Scorpii | δ Ophiuchi |
|---|---|---|---|---|
| Assumed | $15^h\ 38^m\ 5^s.67$ | $15^h\ 46^m\ 38^s.30$ | $16^h\ 6^m\ 28^s.544$ ~~$15^h\ 59^m\ 20^s.044$~~ | $16^h\ 16^m\ 16^s.71$ |
| Rate | $-.07$ | $-.08$ | $-.12$ | $-.14$ |
| Δ Corr. | $+.73$ | $+.78$ | $+.84$ | $+.82$ ? |
| Error of Clock | $-9\ 47.25$ | $-9\ 47.25$ | $-9\ 47.25$ | $-9\ 47.25$ |
| O-C | $15\ 28\ 19.08$ ~~$47.70$~~ | $15\ 36\ 51.75$ | $15\ 56\ 41.98$ | $16\ 6\ 28.24$ |
| C-a | $15\ 28\ 19.09$ | $15\ 36\ 51.71$ ? | $15\ 56\ 42.07$ | $16\ 6\ 28.19$ |
| | $+.01$ | $-.04$ ? | $\pm .09$ | $-.05$ |

| | λ Sagittarii | γ Sagittarii | δ¹ Scorpii | ζ Sagittarii (Corr. illegible) |
|---|---|---|---|---|
| Assumed | $18\ 28\ 25.70$ | $18\ 54\ 52.80$ | $19\ 20\ 2.96$ | $19\ 22\ 44.44$ |
| Rate | $-.34$ | $-.44$ | $-.47$ | $-.48$ |
| Δ Corr. | $+.96$ | $+.95$ | $+.91$ | $+.91$ |
| Error | $-9\ 47.25$ | $-9\ 47.25$ | $-9\ 47.25$ | $-9\ 47.25$ |
| O-C | $18\ 18\ 42.02$ | $18\ 45\ 6.06$ | $19\ 10\ 16.15$ | $19\ 12\ 57.62$ |
| C-a | $18\ 18\ 41.96$ | $18\ 45\ 5.87$ | | $19\ 12\ 57.31$ |
| C-O | $-.06$ | $-.19$ | | $-.31$ |

ε² Sagittarii

| | |
|---|---|
| Assumed | $19\ 5\ 43\ 42.63$ \| $19 = 43 \cdot 42.56$ ? |
| Rate | $-.53$ |
| Δ Corr. & Sign | $+.87$ |
| Error Cl. | $-9\ 47.25$ |
| O-C | $19\ 43\ 55.72$ |
| C-a | $19\ 43\ 55.45$ |
| C-O | $-.27$ |

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1849phae.proj...2733



Aug. 2. 1849. $t_0 = 20^h\,00^m$ Rate = $+2^s.48$

| | D's 1st Limb | α Capricorni | ζ Capricorni | ρ? |
|---|---|---|---|---|
| M. W. | $20^h\,12^m\,32^s.43$ | $20^h\,19^m\,32^s.66$ / 69? | $20^h\,30^m\,6^s.93$ | |
| Rate, | − .02 | − .03 | − .05 | |
| M. W. × PE | + .90 | + .85 | + .91 | |
| − Clock Error | − 9 50.43 | − 9 50.43 | − 9 50.43 | |
| C. a | 20 2 42.88 | 20 9 43.06 | 20 20 17.36 | |
| C. a | ~~20~~ | 20 9 43.05 | 20 20 17.25 | |
| C − O | | − .01 | − .11 | |

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1849phae.proj.:2715



Aug. 3. 1849 $t_0 = 20^h\,10^m$ Rate = $+2^s.68$

| | $\alpha^m$ Capricornii | $\beta$ Capricorni | $\zeta^{th}$ 1$^{st}$ L. | $\alpha^s$ 2$^d$ L. |
|---|---|---|---|---|
| Sh. corr$^n$ | $20^h\ 19^m\ 35^s.73$ | $20^h\ 30^m\ 9^s.69$ ?07? | $21^h\ 04^m\ 48^s.10$ | $21^h\ 6^m\ 59^s.16$ |
| Rate | $+$ .00 | $-$ .02 | $-$ .08 | $-$ .09 |
| Lon. Red$^n$ | $+$ .87 | $+$ .91 | $+$ .89 | $+$ .89 |
| Clock corr | $-\ 9\ 53.54$ | $-\ 9\ 53.54$ | $-\ 9\ 53.54$ | $-\ 9\ 53.54$ |
| O. C | $20\ 9\ 43.06$ | $20\ 20\ 17.04$ | $20\ 54\ 55.37$ | $20\ 57\ 6.42$ |
| C. C | $20\ 9\ 43.06$ | $20\ 20\ 17.25$ | | |
| C$-$O | .00 | $+$ .21 | | |

| | $\varepsilon$ Capricorni | $\gamma$ Capricorni. |
|---|---|---|
| Sh. corr$^n$ | $21^h\ 23^m\ 45^s.53$ | $21^h\ 41^m\ 38^s.19$ |
| Rate | $-$ .12 | $-$ .15 |
| Lon. Red$^n$ | $+$ .89 | $+$ .89 |
| Clock corr | $-\ 9\ 53.54$ | $-\ 9\ 53.54$ |
| O. C | $21\ 13\ 52.62$ | $21\ 31\ 45.39$ |
| C. C | $21\ 13\ 52.61$ | $21\ 31\ 45.75$ |
| C$-$O | $-$ .01 | $+$ .36 |

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1849phae.proj..2755



~~Sept.~~ 9/10 1849 · $t_0 = 5^h 17^m$ Rate = $+3^s.00$

| | β Tauri ~~ζ Capricorni~~ | δ Orionis ~~β Capricorni~~ | ε Tauri ~~α Sth + Sth Cent.~~ | $\alpha^s$ 2d. limb |
|---|---|---|---|---|
| Sh. Wt. | $5^h\ 17^m\ 21^s.64$ | $5^h\ 24^m\ 53^s.93$ / 0? | $5^h\ 29^m\ 13^s.86$ | $5^h\ 47^m\ 22^s.78$ |
| Rate | − .00 | −.01 | − .02 | − .06 |
| 1 Cor + P. Eq. | + .08 / 18? | −.06 | + .02 | + .01 |
| − Error Chr. | − 34.61 | − 34.61 | − 34.61 | − 34.61 |
| O. a | 5 16 47.11 | 5 24 19.25 | 5 28 39.25 | 5 46 48.12 |
| C. a | 5 16 47.04 | 5 24 19.22 | 5 28 39.16 | 5 |
| C − O | − .07 | − .03 | − .09 | |

· Sirius

| | |
|---|---|
| Sh. Wt. | 6 39 5.60 |
| Rate | − .16 |
| 1 Cor + P. Eq. | − 13 |
| − Chr. Er. | − 34.61 |
| O. a | 6 38 30.60 |
| C. a | 6 38 30.59 |
| C − O | − .01 |

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Sept. 10/11 1849. $t_0 = 5^h 47^m$ Rate = $+ 2^s 90$

| | α Orionis | γ Geminorum | Sirius | $\alpha^h$ 2d Limb. |
|---|---|---|---|---|
| M.T. | $5^h\ 47^m\ 39^s 36$ | $6^h\ 14^m\ 28^s 97$ | $6^h\ 39^m\ 8^s 67$ | $6^h\ 49^m\ 55^s 60$ |
| Rate. | .00 | − .05 | − .10 | − .12 |
| I.I+P.E. | − .03 | + .04 | − .12 | + .02 |
| −C.E. | − 37. 85 | − 37. 85 | − 37. 85 | − 37. 85 |
| O.α | 5 47 1.48 | 6 13 51.11 | 6 38 30.60 | 6 49 17.65 |
| C.α | 5 47 1.45 | 6 13 57.08 | 6 38 30.62 | |
| C−O | − .03 | − .03 | + .02 | |

| | Castor. | Procyon. | Ballard. |
|---|---|---|---|
| M.T. | $7^h\ 25^m\ 36^s 38$ | $7^h\ 32^m\ 2^s 84$ | $7^h\ 36^m\ 43^s 09$ |
| Rate. | − .20 | − .21 | − .22 |
| I.I+P.E | + .08 | − .03 | + .05 |
| − C.E. | − 37. 85 | − 37. 85 | − 37. 85 |
| O.α | 7 24 58.41 | 7 31 24.75 | 7 36 5.07 |
| C.α | 7 24 58.54 | 7 31 24.63 | 7 36 5.15 |
| C−O | + .13 | − .12 | + .08 |

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1849phae.proj...2715



Sept. 24. 1849. $t_0 = 18^h\ 10^m$ Rate $= -0^s.90$

| | D 4th/8th L. | α Lyrae | λ Sagittarii |
|---|---|---|---|
| Sh. m. | $18^h\ 9^m\ 20^s.81$ | $18^h\ 32^m\ 51^s.64$ | $19^h\ 1^m\ 49^s.63$ |
| Rate | .00 | +.01 | +.01 |
| L.C + P.E. | +.01 | +.12 | .00 |
| − C.E. | −1 0.86 | −1 0.86 | −1 0.86 |
| G. ♐ | 18 8 19.96 | 18 31 50.91 | 19 0 48.78 |
| C. ♐ | | 18 31 50.91 | 19 0 48.99 |
| C − O | | .00 | +.21 |

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Sept. 27. 1849. $t_0 = 20^h\ 13^m$ Rate = $-0^s.50$ (to clock stat)

| | β Capricorni | ν Capricorni | 61 1st limb | γ Capricorni |
|---|---|---|---|---|
| M.ws | $20^h\ 13^m\ 33^s.37$ | $20^h\ 32^m\ 28^s.66$ | $21^h\ 5^m\ 28^s.00$ | $21^h\ 32^m\ 45^s.24$ |
| Rate | .00 | +.01 | +.02 | +.03 |
| I. Cor + P.E. | −.01 | −.02 | −.01 | −.02 |
| − Err. Chr | − 59.45 | − 59.45 | − 59.45 | − 59.45 |
| O.a | 20 12 33.91 | 20 31 29.20 | 21 4 28.56 | 21 31 45.80 |
| C.a | 20 12 33.70 | 20 31 29.29 | | 21 31 45.76 |
| C−O | −.21 | +.09 | | −.04 |

δ Capricorni

| | |
|---|---|
| M.ws. | $21^h\ 39^m\ 43^s.96$ |
| Rate. | +.03 |
| I. Cor + P.E. | −.02 |
| − Chr. Err. | − 59.65 |
| O.a | 21 38 44.32 |
| C.a | 21 38 44.69 |
| C−O | +.17 |

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Oct 11/12. 1849. $h_0 = 8^h\,00^m$ Rate = $-4^s.50$

| | δ Ursae Majoris | ε Leonis | α Leonis | Q. 2. |
|---|---|---|---|---|
| h.m | $9^h\,23^m\,34^s.56$ | $9^h\,38^m\,7^s.17$ | $10^h\,1^m\,10^s.53$ | $10^h\,29^m\,16^s.41$ |
| Rate | + .03 | + .03 | + .04 | + .05 |
| I. Cor + P. E | + .10 | + .04 | + .01 | − .06 |
| − Chr Error | − 50.00 | − 50.00 | − 50.00 | − 50.00 |
| C. a | 9 22 44.69 | 9 37 17.24 | 10 0 20.58 | 10 28 26.40 |
| C. a | 9 22 44.32 | 9 37 17.37 | 10 0 20.50 | |
| c − o | − .37 | + .13 | − .08 | |

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The following are the formulae of reduction adopted for the usual observations

Let $a$ = azimuth coefficient

$b$ = level ——

$c$ = collimation ——

$d = a \sin\phi + b \cos\phi + c$

$e = -a \cos\phi + b \sin\phi$

Now the correction for instrumental errors is equal to

$$\left.\begin{aligned} & a \sin(\phi - \delta) \sec\delta + b \cos(\phi - \delta) \sec\delta + c \sec\delta \\ & = d + e \operatorname{tg}\delta + c(\sec\delta - 1) \end{aligned}\right\}$$

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1850 May 19th.— $T_0 = 11^h\,00^m$ Rate = $+2^s.22$

a = −.02 b = −.02 c = +.17 d = +.14 e = .00

| | a Mean Majors | δ Semis | ☾'s 1st Limb | 77 Semis. |
|---|---|---|---|---|
| M. Mn. | $10^h\,55^m\,59^s.94$ | $11^h\,7^m\,42^s.19$ | $11^h\,11^m\,59^s.64$ | $11^h\,14^m\,59^s.02$ |
| Rate | + 0.01 | − 0.01 | − 0.02 | − 0.02 |
| a | + 0.01 | − 0.01 | − 0.01 | − 0.01 |
| b | − 0.04 | − 0.02 | − 0.02 | − 0.02 |
| c | + 0.37 | + 0.18 | + 0.18 | + 0.18 |
| Sum | + 0.34 | + 0.15 | + 0.15 | + 0.15 |
| | 10 56 0.29 | 11 7 42.33 | 11 11 59.77 | 11 14 59.15 |
| C. a | 10 54 25.89 | 11 6 8.22 | | |
| | + 1 34.40 | − 1 34.11 | | |
| | + 1 34.20 | − 1 34.20 | − 1 34.20 | − 1 34.20 |
| O. a | 10 54 26.09 | 11 6 8.13 | 11 10 25.57 | 11 13 24.95 |
| C − O | − .20 | + .09 | | |

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1850. June 14th  a = +14  b = −.08  c = +15  Rate +2s4  $t_0$ = 10h 00m

d = +.48  e +.16

+39°

Q.1  α Leonis  12 Camum. +39°

| | | | |
|---|---|---|---|
| Mean. | 9 „ 58 „ 18.11 | 10 „ 02. 58.34 | 12 „ 57 „ 36.80 |
| Rate. | .00 | .00 | − .29 |
| a | + .06 | + .07 | + .01 |
| b | − .08 | −.08 | −.10 |
| c | + .15 | + .13 | +.19 |
| Sum. | + .13 | + .12 | +.10 |
| t | 9 58 18.24 | 10 2 58.46 | 12 51 36.61 |
| Tab. R | | 10 0 22.74 | 12 49 0.99 |
| u | − | 2 35.72 | 2 35.62 |
| $u_0$ | − 2 35.68 | 2 35.68 | 2 35.68 |
| Obs R | 9 55 42.56 | 10 0 23.78 | 12 49 0.93 |
| C − O. | | −0.04 | + 0.06 |

June 21st 1850  a = +.18  b = −.04  c = +.14  Rate +2.34  $t_0$ = 13h 00m

12 Can Ven. +39°  ε Virginis +10°  D's I st Limb.  Antares. −26°

| | | | | |
|---|---|---|---|---|
| | 9h 43 | 7769 | 7768 | 7769 |
| Mean | 12 „ 51 „ 53.07 | 13 „ 20 „ 11.50 | 16 „ 04 „ 41.18 | 16 „ 23 „ 07.80 |
| Rate | + .01 | − .03 | − .30 | − .30 |
| a | + .01 | + .15 | + .16 | + .19 |
| b | − .05 | − .04 | − .04 | − .04 |
| c | + .18 | + .09 | + .08 | + .06 |
| Sum | + .14 | + .20 | + .20 | + .21 |
| t | 12 51 53.22 | 13 20 11.69 | 16 4 41.08 | 16 23 7.71 |
| Tab. R. | 12 49 0.87 | 13 17 19.07 | | 16 20 15.40 |
| μ | − 2 52.35 | 2 52.60 | | 2 52.31 |
| $\mu_0$ | − 2 52.42 | 2 52.42 | | 2 52.42 |
| Obs. R. | 12 49 0.80 | 13 17 19.25 | | 16 20 15.29 |
| C − O. | − 0.07 | + 0.18 | | − 0.11 |

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1849phae.proj...2415



1850 Sept 16th  a = +.06  b = +.12  c = +.17  Rate +2.84  $t_0$ 20.00

| | $\varepsilon^2$ Capricorni −13° | Moon's 1st Limb −18° | $\gamma$ Capri −20° | $\beta$ Aquarii −8° |
|---|---|---|---|---|
| Mean | 20 „ 10 „ 31.6 | 20 „ 31 „ 36.7 | 21 „ 02 „ 19.14 | 21 „ 30 „ 06.85 |
| Rate | −.02 | −.06 | −.12 | −.18 |
| a | +.05 | +.05 | +.05 | +.04 |
| b | +.07 | +.06 | +.06 | +.08 |
| c | +.18 | +.18 | +.18 | +.17 |
| Sum | +.30 | +.29 | +.29 | +.29 |
| t | 20 10 31.32 | 20 31 36.93 | 21 2 19.31 | 21 30 6.96 |
| Tab. R. | 20 9 45.87 | | 20 55 54.07 | 21 23 41.96 |
| $\mu$ | | | | |
| $\mu_0$ | | | | |
| Obs. R. | | | | |

Sept 17th  a = +.06  b = +.12  c = +.17  Rate +2.53  $t_0$ = 21.00

| | $\gamma$ Capricorni −20° | $\nu$ Aquarii −12° | Moon's First Limb −16° | $\delta$ Capricorni −17° |
|---|---|---|---|---|
| Mean | 21 „ 02 „ 22.14 | 21 „ 07 „ 55.14 | 21 „ 22 „ 04.35 | 21 „ 44 „ 16.0 |
| Rate | 00 | −.01 | −.04 | −.08 |
| a | +.05 | +.05 | +.05 | +.05 |
| b | +.06 | +.07 | +.06 | +.06 |
| c | +.18 | +.17 | +.18 | +.18 |
| Sum | +.30 | +.29 | +.29 | +.29 |
| t | 21 2 22.44 | 21 7 55.42 | 21 22 4.64 | 21 44 16.21 |
| Tab. R. | 20 55 54.07 | 21 1 27.45 | | 21 38 47.84 |
| $\mu$ | — 6 28.37 | — 6 27.97 | | 6 28.37 |
| $\mu_0$ | — 6 28.24 | 6 28.21 | 6 28.29 | 6 28.21 |
| Obs. R. | 20 55 54.20 | 21 1 27.18 | 21 15 26.35 | 21 38 47.97 |
| C−O | − .13 | + .27 | | − .13 |

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1849phae.proj.2715

2 1/2

1850 Sept 17th contin  a = +.03 .26  b = +.11 .12  c = +.17 .19  Rate + 2.75  $t_0$ = 06.00

Sept 29/30 AM.

μ Capricorni −14°  Sirius −16°  δ Geminorum +22°  Procyon. +6°

| | | | | |
|---|---|---|---|---|
| Mean | 21 ‟ 57 ‟ 37.21 | 6 ‟ 35 ‟ 46.20 | 7 ‟ 18 ‟ 13.94 | 7 ‟ 38 ‟ 31.07 |
| Rate | − .09 | − .07 | − .15 | − .19 |
| d | + .02 | σ + .02 | + .01 | + .03 |
| b | + .06 | + .06 | + .11 | + .09 |
| c | + .18 | + .20 | + .21 | + .19 |
| Sum. | + .26 | + .28 | + .33 | + .31 |
| t | 21 51 37.38 | 6 35 46.41 | 7 18 14.12 | 7 38 31.19 |
| Tab. R. | 21 45 9.31 | 6 38 33.56 | 7 11 11.08 | 7 38 27.88 ~~38 9.05~~ |

6.45.36.70?

Sept 29/30 AM.  a = +.03  b = +.11  c = +.19  Rate + 2.75  $t_0$ = 7.00

δ Geminorum +25°  Moon +20°

| | | |
|---|---|---|
| Mean | 7 ‟ 43 11.71 | 8 ‟ 06 ‟ 56.85 |
| Rate | − .19 | − .24 |
| a | + .04 | + .01 |
| b | + .12 | + .11 |
| c | + .22 | + .20 |
| Sum | + .35 | + .32 |
| t | 7 43 11.87 | 8 6 56.93 |
| Tab. R. | 7 36 9.05 | |
| | + 2.82 | + 2.82 |
| | 7 59 54.11 | |

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1850 Oct 14th  a=+.02  b=+.12  c=+.18  Rate +2.61  $t_o$ = 20.00

α² Capricorni −20°  Moons First Limb −18°  ν Aquarii −12°

| | | | |
|---|---|---|---|
| Mean | 20 ⁿ 10 ⁿ 26.10 | 20 ⁿ 56 ⁿ 59.21 | 21 ⁿ 02 ⁿ 07.98 |
| Rate | −.02 | −.09 | −.11 |
| a | +.01 | +.01 | 00 |
| b | +.12 | +.12 | +.12 |
| c | +.19 | +.19 | +.18 |
| Sum | 20 10 26.40 | 20 56 59.44 | 21 2 7.97 |
| ∓ | | | |
| Tab. R. | 20 9 46.57 | | 21 1 27.10 |
| | + − 40.83 | | + 40.87 |
| | + − 40.83 | − + 40.83 | − + 40.83 |
| Obs. R. | 20 9 45.57 | 20 56 18.61 | 21 1 27.14 |
| C−O | .00 | | −.04 |

Oct 15th.  a=+.02  b=+.12  c=+.18  Rate +4.03  $t_o$ = 21.00

ν Aquarii −12°  i Capricorni −17°  Moon −15°  δ Aquarii −7°

| | | | | |
|---|---|---|---|---|
| Mean | 21 ⁿ 02 ⁿ 44.0 | 21 ⁿ 15 ⁿ 12.14 | 21 ⁿ 47 ⁿ 18.07 | 22 ⁿ 10 ⁿ 14.21 |
| Rate | −.00 | −.05 | −.18 | −.20 |
| a | .00 | +.01 | +.01 | .00 |
| b | +.12 | +.12 | +.12 | +.12 |
| c | +.18 | +.19 | +.19 | +.18 |
| Sum | +.30 | +.27 | +.19 | +.10 |
| ∓ t | 21 2 44.30 | 21 15 12.41 | 21 47 18.26 | 22 10 14.31 |
| Tab. R. | 21 1 27.09 | 21 13 55.37 | | 22 8 57.16 |
| − | + 1 17.21 | + 1 17.04 | | + 1 17.15 |
| − | + 1 17.13 | 1 17.13 | 1 17.13 | 1 17.13 |
| Obs. R. | 21 1 27.17 | 21 13 55.28 | 21 46 1.13 | 22 8 57.18 |
| C−O | + .08 | −.09 | | +.02 |

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1849phae.proj..2715

44

1850 Oct 16th a = +.02 b = +.11 c = +17 Rate +3.95 $t_0$ = 21.00

ι Aquarii −15° θ Aquarii. −7° Moon. −12° λ Aquarii. −8°

| | | | | |
|---|---|---|---|---|
| Mean | 21 . 59 . 43.28 | 22 . 10 . 18.43 | 22 . 35 . 10.21 | 22 . 46 . 11.0 |
| Rate | −.16 | −.19 | −.25 | −.28 |
| a | +.01 | .00 | .00 | .00 |
| b | +.11 | +.11 | +.11 | +.11 |
| c | +.18 | +.17 | +.17 | +.17 |
| | +.14 | +.09 | +.03 | +.00 |
| t | 21 59 43.42 | 22 10 18.52 | 22 35 10.24 | 22 46 11.00 |
| | 21 58 22.00 | 22 8 57.15 | | 22 44 49.55 |
| | + 1 21.37 | +1 21.37 | | + 1 21.45 |
| | + 1 21.40 | +1 21.40 | + 1 21.40 | + 1 21.40 |
| | 21 58 22.02 | 22 8 57.12 | 22 33 48.84 | 22 44 49.60 |
| | +.03 | +.05 | | −.05 |

1850 Oct 28th +.16 = a = +.01 b = −.02 c = +.13 Rate +4.00 $t_0$ = 9.00

Moons 2nd Limb Regulus +13° γ Leonis +21°

| | | | |
|---|---|---|---|
| Mean | 9 . 44 . 40.93 | 10 . 02 . 34.78 | 10 . 13 . 23.71 |
| Rate | −.12 | −.18 | −.21 |
| a | .00 | +.01 | .00 |
| b | −.02 | −.02 | −.02 |
| c | +.13 | +.13 | +.14 |
| | −.01 | −.06 | −.09 |
| | 9 44 40.92 | 10 02 34.72 | 10 13 23.62 |
| | | 10 0 23.87 | 10 11 42.76 |
| | | 2 10.85 | 2 10.86 |
| | 2 10.86 | 2 10.86 | 2 10.86 |
| | 9 42 30.06 | 10 0 23.86 | 10 11 42.76 |

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1858 Oct 29th  a = +.01  b = .00  c = .00 +.13  Rate +2.94  $t_0$ = 10..00

Nov 13th

| | Moons 2nd Limb +12° | α Urs Maj +63° | δ Leonis +21° | β Lyrae +33° |
|---|---|---|---|---|
| Mean | 10 „ 42 „ 52.07 | 10 „ 56 „ 38.40 | 11 „ 08 „ 21.57 | 18 „ 44 „ 29.64 |
| Rate | −.08 | −.11 | −.14 | −.09 |
| a | .00 | +.09 | 00 | −.01 |
| b | 00 | +.01 | .00 | +.06 |
| c | +.13 | +.29 | +.14 | +.10 |
| S. | +.05 | +.28 | +.00 | +.12 |
| t | 10 42 52.12 | 10 56 38.68 | 11 8 21.57 | 18 44 29.76 |
| Sid. R. | | 10 54 25.38 | 11 6 8.25 | 18 44 32.79 |
| − + | | 2 13.30 | 2 13.32 | −3.03 |
| − + | 2 13.31 | 2 13.31 | 2 13.31 | |
| | 10 40 38.81 | 10 54 25.37 | 11 6 8.26 | |
| C−O | | +.01 | −.01 | |

1850 Nov 13th  a = −.06  b = +.05  c = +.14  Rate −2.04 +2.96  $t_0$ = 19..00

| * | Moon 1st Limb −10° | φ Aquarii −7° | ψ³ Aquarii −10° | δ Aquilae +3° |
|---|---|---|---|---|
| Mean | 23 „ 02 „ 46.10 | 23 „ 06 „ 32.04 | 23 „ 11 „ 08.20 | 19 „ 17 „ 53.95 |
| Rate | −.61 | +.62 (18) | +.63 (19) | −.15 |
| a | −.04 −.03 | −.03 | −.04 | −.02 |
| b | +.05 | +.05 | +.05 | +.05 |
| c | +.14 | +.14 | +.14 (8.54) | +.10 |
| | 23 2 45.64 | 23 6 31.58 (32.38) | 23 11 7.72 | 19 17 53.97 |
| | | 23 6 35.40 | 23 11 11.48 | 19 17 57.06 |
| | | 7 3.82 (3.02) | + 3.76 (2.74) | −3.09 |
| | +3.15 | +3.15 | +3.15 | |
| | 23 2 48.79 | 23 6 35.53 | 23 11 11.69 | |
| | | +.13 | +.21 | |

* For β Aquarii, α Aquarii & ζ Pegasi See Page 85.

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1849phae.proj...2715

16

1850 Nov 14th  a = −.07  b = +.05  c = +.16  Rate −3.21  $t_0$ = 22.00

* ∅ Aquarii. −7°  $\psi^3$ Aquarii −10°  Moons 1st Limb −6°  33 Piscium −7°

| | | | | |
|---|---|---|---|---|
| Mean | 23 ″ 06 ″ 29.03 | 23 ″ 11 ″ 05.34 | 23 ″ 50 ″ 27.70 | 23 ″ 57 ″ 35.43 |
| Rate | +.16 | +.16 | +.24 | +.46 |
| a | −.05 | −.05 | −.04 | −.05 |
| b | +.05 | +.05 | +.05 | +.05 |
| c | +.16 | +.16 | +.16 | +.16 |
| | +.32 | +.32 | +.41 | +.62 |
| | 23 6 29.35 | 23 11 5.66 | 23 50 28.11 | 23 57 35.85 |
| | 23 6 35.39 | 23 11 11.47 | 23 51 +.48 | 23 57 41.82 |
| | +6.04 | +5.81 | + | +5.97 |
| | +6.16 | +6.16 | +6.16 | +6.16 |
| | 23 6 36.51 | 23 11 11.82 | 23 50 34.27 | 23 57 42.01 |
| | +0.12 | −0.35 | | −0.19 |

1850 Nov 14th continued  Nov 15th  a = −.07  b = +.05  c = +.14  Rate −2.70  $t_0$ = 22.00

| | | | | |
|---|---|---|---|---|
| | γ Pegasi +14° | 27 Piscium −4° | 33 Piscium −7° | Moons 1st Limb −1° |
| Mean | 0 ″ 05 ″ 27.31 | 23 ″ 50 ″ 52.91 | 23 ″ 57 ″ 32.74 | 0 ″ 38 ″ 40.13 |
| Rate | +.28 | +.21 | +.22 | +.30 |
| a | −.03 | −.05 | −.05 | −.06 |
| b | +.05 | +.05 | +.05 | +.05 |
| c | +.14 | +.14 | +.14 | +.14 |
| | +.44 | +.35 | +.36 | +.43 |
| | 0 05 27.78 | 23 50 53.26 | 23 57 33.10 | 0 38 40.56 |
| | 0 05 33.73 | 23 51 1.97 | 23 57 41.81 | |
| | +5.95 | +8.71 | +8.71 | |
| | +6.16 | +8.64 | +8.64 | +8.64 |
| | 0 5 33.94 | 23 51 1.90 | 23 57 41.74 | 0 38 49.2 |
| | −0.21 | −.07 | −.07 | |

* For B Ceres, γ Aquilae, ζ Pegasi & ε Pegasi See Page 85

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1849phae.proj...2413



1850 Nov 15th ... a = -.08 b = +.05 c = +.14 Rate + 3.12 t5

| | 20 Ceti −2° | c Piscium +5° | a Aquarii −1° | Regas +10° |
|---|---|---|---|---|
| Mean | 0 „ 45 „ 14.21 | 1 „ 00 „ 32.83 | 21 „ 57 „ 57.79 .00 | 22 „ 33 „ 52.11 |
| Rate | +.31 ~~.49~~ | +.40 ~~.53~~ | ~~.12~~ | +.07 ~~.21~~ |
| a | −.05 | −.05 | −.06 | −.04 |
| b | +.05 | +.05 | +.05 | +.05 |
| c | +.14 | +.14 | +.14 | +.14 |
| | ~~.35~~ +.45 | +.54 ~~+.38~~ | +.13 | +.22 |
| | 0 45 14.66 | 1 00 32.87 | 21 57 57.92 | 22 33 52.33 |
| | 0 45 23.25 | 1 00 41.64 | 21 58 6.53 | 22 34 1.00 |
| | +8.59 | +8.77 | +8.6 | +8.67 |
| | +8.64 | +8.64 | +8.64 | +8.64 |
| | 0 45 ~~23~~.30 | 1 00 41.54 | 21 58 6.56 | 22 34 0.31 |
| | +.05 | −.13 | +.03 | −.05 |

1850 Dec 11th a = −.24 b = −.05 c = −.26 Rate ~~+~~ −2.78 t5 = 2.00

| * | ψ Aquarii −10° | Moons 1st Limb −8° | 27 Piscium −4° | 33 Piscium −7° |
|---|---|---|---|---|
| Mean | 23 „ 09 „ 59.11 | 23 „ 29 „ 11.97 | 23 „ 49 „ 49.61 | 23 „ 56 „ 29.38 |
| Rate | ~~+.13~~ | ~~+.16~~ 17 | ~~+.29~~ .21 | ~~+.10~~ +.23 |
| a | −.19 | −.19 | −.17 | −.18 |
| b | −.05 | −.05 | −.05 | −.05 |
| c | −.27 | −.26 | −.28 | −.26 |
| | −.38 | −.33 | −.27 | −.26 |
| | 23 9 58.73 | 23 29 11.64 | 23 49 49.34 | 23 56 29.12 |
| | 23 11 11.14 | | 23 51 1.69 | 23 57 41.53 |
| | +1 12.41 | | +1 12.35 | +1 12.41 |
| | +1 12.54 | +1 12.54 | +1 12.54 | +1 12.54 |
| | 23 11 11.27 | 23 30 24.18 | 23 51 1.88 | 23 57 41.66 |
| C−O | ~~+~~ .13 | | −.19 | −.13 |

* For a Aquarii and a Andromedæ See Page 86

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1849phae.proj..2715



1850 Dec 13th  a = −.33  b = −.04  c = −.27  Rate + ~~−2.55~~  $t_0$ = ~~23 00~~

*

| | δ Piscium +7° | 20 Ceti −2° | Moons 1st Limb +1° | O Piscium +8° |
|---|---|---|---|---|
| Mean | 0 „ 39 „ 39.72 | 0 „ 44 „ 05.78 | 1 „ 04 „ 04.07 | 1 „ 36 „ 14.18 |
| Rate | + .18 | + ~~.19~~ | + ~~.12~~ .22 | + ~~.19~~ .26 |
| a | − .20 | − .21 | − .22 | − .19 |
| b | − .04 | − .04 | − .04 | − .04 |
| c | − .27 | − .27 | − .27 | − .27 |
| J. | − .33 | − .33 | − .31 | − .24 |
| | 0 39 39.39 | 0 44 5.45 | 1 04 3.76 | 1 36 13.94 |
| | 0 40 56.70 | 0 45 23.02 | | 1 37 31.55 |
| | + 1 17.31 | + 1 17.57 | | + 1 17.61 |
| | ~~0 41 17.65~~ | + 1 17.65 | + 1 17.65 | + 1 17.65 |
| | 0 40 57.04 | 0 45 23.10 | 1 5 21.41 | 1 39 31.59 |
| | − .34 | − .08 | | − .04 |

1850 Dec 14th  a = −.38  b = −.06  c = −.27  Rate + ~~−2.75~~  $t_0$ = ~~0.00~~

**

| | O Piscium +8° | ζ Ceti | Moons 1st Limb +6° | ζ' Ceti +8° |
|---|---|---|---|---|
| | Not given in the list | | | |
| Mean | 1 „ 36 „ 10.84 | 1 „ 2 „ 45.57 | 1 „ 53 „ 34.31 | 2 „ 03 „ 45.55 |
| Rate | + ~~.07~~ .18 | + ~~.08~~ .17 | + .22 | + .23 |
| a | − .22 | | − ~~.23~~ | − ~~.22~~ |
| b | − .06 | | − .05 | − .05 |
| c | − .27 | − .2 | − .27 | − .27 |
| | − .37 | | − .33 | − .31 |
| | 1 36 10.47 | | 1 53 33.98 | 2 03 45.24 |
| | 1 37 31.54 | | ~~5~~ | 2 5 6.39 |
| | + 1 21.07 | | | + 1 21.15 |
| | + 1 20.90 | | + 1 20.90 | + 1 20.90 |
| | 1 37 31.37 | | 1 54 54.88 | 2 5 6.14 |
| | + .17 | | | + .25 |

ζ Arietis B Urs Maj

*  For ι Piscium, α Andromeda & γ Pegasi, See Page 56

**  For α Andromeda & γ Pegasi & β Ceti. See Page 87

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1849phae.proj...2715



a = -.38 „ b = -.06 „ c = -.27

1850 Dec. 14th contin | Dec 18th " a = -.32 b = -.16 c = +.21 Rate +3.01 $t_0$ = 4..00

| | * ζ' Ceti +8° | O' Orionis +14° | ι Tauri +21° | Moons 1st Limb +20° |
|---|---|---|---|---|
| Mean | 2 . 18 „ 53.61 | 4 „ 42 „ 34.71 | 4 „ 52 „ 39.85 | 5 . 43 „ 33.77 |
| Rate | +.26 | +.09 | +.11 | +.21 |
| a | −.22 | −.16 | −.13 | −.13 |
| b | −.16 | −.16 | −.16 | −.16 |
| c | −.27 | +.22 | +.22 | +.22 |
| | −.39 | −.01 | +.04 | +.14 |
| | 2. 18. 53.22 | 4 42 34.70 | 4 52 39.99 | |
| | 2 20 14.49 | 4 44 6.74 | 4 54 11.91 | |
| | +1 21.27 | +1 32.04 | +1 32.02 | |
| | +1 20.90 | +1 31.95 | +1 31.95 | +1 31.95 |
| | +.37 | 4 44 6.65 | 4 54 11.84 | 5 45 5.72 |
| | | +.09 | +.07 | |

1850 Dec 18th " a = b = c = Rate +2.66 $t_0$ = 4..00

Moons 2nd Limb | μ Geminorum +23° | γ Geminorum +17°

| | | | |
|---|---|---|---|
| Mean | 5 „ 45 „ 59.18 | 6 „ 12 „ 24.81 | 6 „ 27 „ 34.20 |
| Rate | +.22 | +.28 | +.31 |
| a | −.13 | −.12 | −.15 |
| b | −.16 | −.17 | −.16 |
| c | +.22 | +.23 | +.22 |
| | +.15 | +.22 | +.22 |
| | | 6 12 25.03 | 6 27 34.42 |
| | | 6 13 57.08 | 6 29 6.44 |
| | | +1 32.05 | +1 32.02 |
| | +1 31.95 | +1 31.95 | +1 31.95 |
| | 5 45 31.13 | 6 13 56.98 | 6 29 6.37 |
| | | +.10 | +.07 |

β Orionis δ Orionis

* Dec 18th. Fm. α Andromedæ, ν Ceti, β Ursæ Min, 2d Page 87

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1849phae.proj ..2715

1850 Dec 26th 27th a = −.39 b = −.13 c = +.23 Rate = 2.58 $t_0$ = 16.00

| | α Virginis −10° | ζ Virginis 00° | Moons 2nd Limb −4° |
|---|---|---|---|
| Mean | 13 h 15 m 23.30 | 13 h 25 m 08.43 | 13 h 42 m 12.16 |
| Rate | +.24 +.03 | +.30 +.05 | +.37 +.08 |
| a | −.32 | −.38 | −.29 |
| b | −.13 | −.13 | −.13 |
| c | +.23 | +.23 | +.23 |
| | +.12 | +.13 | +.18 |
| | 13 15 23.42 | 13 25 08.56 | 13 42 12.36 |
| | 13 17 19.77 | 13 27 4.98 | |
| | +1 56.35 | +1 56.42 | |
| | +1 56.49 | +1 56.49 | +1 56.49 |
| | 13 17 19.91 | 13 27 5.05 | 13 44 8.85 |
| | −.14 | −.07 | |

For January 6th See Page 89.

1851 Jan 11th a = −.35 b = −.09 c = +.25 Rate = +2.62 +3.10 $t_0$ = 1.00

| | α Piscium +2° | ζ′ Ceti +8 | Moons 1st Limb +8° | BAC 8415 +9° |
|---|---|---|---|---|
| Mean | 1 51 39.94 | 2 h 02 m 26.13 | 2 h 19 m 49.60 | 2 h 34 m 13.60 |
| Rate | +.10 | +.11 | +.15 | +.17 |
| a | −.23 | −.27 | −.21 | −.20 |
| b | −.09 | −.09 | −.09 | −.09 |
| c | +.25 | +.25 | +.25 | +.25 |
| | +.03 | +.06 | +.10 | +.13 |
| | 1 51 39.97 | 2 02 26.19 | 2 19 49.70 | 2 34 13.73 |
| | 1 54 20.09 | 2 05 6.13 | | 2 36 53.30 |
| + | 2 40.12 | 2 29.94 | | 2 39.57 |
| | 2 40.00 | 2 40.00 | 2 40.00 | 2 40.00 |
| | 1 54 19.97 | 2 05 6.19 | 2 22 29.70 | 2 36 53.73 |
| | +.12 | −.06 | | −.43 |

β Geminis β Cassiopeiæ, Spicæ.

* For θ′ Ceti. α Arietis. γ Ceti & β Ursæ Minoris See Page 88

** For α Andromedæ. γ Pegasi ο Arietis ο Ceti & π Arietis See Page 88 & 89

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1849phae.proj...2715



1857 Jan 13th  a = −.34  b = −.05  c = +.27  Rate − 0.24  $t_0$ = 3..50

| * | ℓ Lauri +11° | λ Lauri +12° | Moons 1st Limb +16° | ε Lauri +19° |
|---|---|---|---|---|
| Mean | 3 .. 39 .. 52.50 | 3 .. 52 .. 11.95 | 4 .. 10 .. 42.11 | 4 .. 19 .. 41.70 |
| Rate | +.01 | +.01 | +.01 | +.01 |
| a | −.18 | −.18 | −.16 | −.15 |
| b | −.05 | −.05 | −.05 | −.05 |
| c | +.28 | +.28 | +.28 | +.28 |
| | +.06 | +.06 | +.08 | +.09 |
| | 3 39 52.56 | 3 52 12.01 | 4 10 42.19 | 4 19 41.77 |
| | 3 40 6.33 | 3 52 25.90 | | 4 19 55.29 |
| | + 13.77 | + 13.89 | | + 13.50 |
| | + 13.89 | + 13.89 | + 13.89 | + 13.89 |
| | 3 40 6.45 | 3 52 25.90 | 4 10 56.08 | 4 19 55.68 |
| | −.12 | +.00 | | −.39 |

1857 Jan 13th con

a Lauri +16°

| | |
|---|---|
| Mean | 4 .. 27 .. 08.83 |
| Rate | +.01 |
| a | −.16 |
| b | −.05 |
| c | +.28 |
| | +.08 |
| | 4 27 8.91 |
| | 4 27 22.80 |
| | +13.89 |
| | +13.89 |
| | 4 27 22.80 |
| | .00 |

* For α Andromedæ γ Pegasi α Cassiopeæ β Ceti α Orionis & μ Gem Lee Page 90

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1849phae.proj...2715

1857 Feb 7th  a = −.25  b = −.09  c = +.15  Rate +0.12  $t_0$ = 2.00

| | α Arietis +23° | Moons 1st +6′ Limb | f² Ceti +8° | σ Ceti +5° |
|---|---|---|---|---|
| Mean | 1 58 33.15 | 2 03 09.30 | 2 20 00.83 | 2 27 49.93 |
| Rate | +.00 | +.01 | +.00 | +.00 |
| a | −.09 | −.16 | −.15 | −.16 |
| b | −.09 | −.09 | −.09 | −.09 |
| c | +.17 | +.15 | +.15 | +.15 |
| S | | −.10 | −.09 | −.10 |
| | 1 58 +33.17/32 | 2 03 9.20 | 2 20 0.174 | 2 27 49.83 |
| | 1 58 46.20 | | 2 20 13.87 | 2 28 2.84 |
| | + 12.88 | | + 13.13 | + 13.01 |
| | + 12.88 | + 12.88 | + 12.88 | + 12.88 |
| | 1 58 46.20 | 2 03 22.08 | 2 20 13.62 | 2 28 2.71 |
| | .00 | | + .25 | + .13 |

1857 Feb 11th  a = −.25  b = −.11  c = +.12  Rate −0.22  $t_0$ = 4.00

| | 11 Orionis +15° | 15 Orionis +15° | β Fauri +25° | Moons 1st +20° Limb |
|---|---|---|---|---|
| Mean | 4 55 57.19 | 5 00 58.15 | 5 16 40.55 | 5 42 14.90 |
| Rate | +.01 | +.01 | +.01 | +.01 |
| a | −.12 | −.12 | −.07 | −.10 |
| b | −.11 | −.11 | −.12 | −.11 |
| c | +.12 | +.12 | +.14 | +.13 |
| | −.10 | −.10 | −.04 | −.07 |
| | 4 55 57.09 | 5 00 58.05 | 5 16 40.53 | 5 42 14.83 |
| | 4 56 3.50 | 5 1 10.50 | 5 16 52.83 | |
| | + 12.41 | + 12.45 | + 12.30 | |
| | + 12.32 | + 12.32 | + 12.32 | + 12.32 |
| | 4 56 03 41 | 5 1 10 37 | 5 16 52.85 | 5 42 27.15 |
| | +.09 | +.13 | −.02 | ---- |

* For Feb 7th σ Ceti β Orionis β Fauri, δ Orionis α Leporis ε Orionis & α Orionis See Page 90 & 91

* * Feb 11th For β Orionis, δ Orionis, ε Orionis & α Orionis See Page 91

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1849phae.proj...2743



1857 Mar 14th  a = −.22  b = −.16  c = +.17  Rate + 0.36  $t_o$ = 8.00

| * | δ Cancri +19° | Moons First Limb +17° | ε Leonis +18° | γ Leonis +21° |
|---|---|---|---|---|
| Mean | 8 36 07.52 | 9 28 15.21 | 10 00 20.48 | 10 11 39.87 |
| Rate | −.01 | −.05 | −.03 | −.04 |
| a | −.10 | −.10 | −.12 | −.09 |
| b | −.15 | −.15 | −.14 | −.16 |
| c | +.18 | +.19 | +.18 | +.18 |
| | −.08 | −.11 | −.11 | −.19 |
| | 8 36 7.46 | 9 28 15.10 | 10 00 20.29 | 10 11 39.68 |
| | 8 36 13.19 | | 10 00 26.77 | 10 11 45.89 |
| | + 5.73 | | + 6.48 | + 6.21 |
| | + 6.26 | + 6.26 | + 6.26 | + 6.26 |
| | 8 36 13.72 | 9 28 21.36 | 10 00 26.63 | 10 11 46.02 |
| | − .33 | | + .14 | − .13 |

6.76

1857 April 9th  a = −.07  b = −.14  c = +.06  Rate −2.54  $t_o$ = 5.00

| ** | α Orionis +7° | $\chi^5$ Aurigæ +21° | Moons 1st Limb +21° | μ Geminorum +23° |
|---|---|---|---|---|
| Mean | 5 46 55.30 | 5 28 33.47 | 5 58 17.18 | 6 13 46.01 |
| Rate | +.08 | +.06 | +.11 | +.13 |
| a | −.05 | −.03 | −.03 | −.02 |
| b | −.11 | −.14 | −.14 | −.14 |
| c | +.06 | +.06 | +.06 | +.07 |
| Sum | −.02 | −.05 | .00 | +.04 |
| + | 5 46 55.28 | 5 28 33.42 | 5 58 17.18 | 6 13 46.05 |
| Vab M | 5 47 5.77 | 5 28 43.80 | | 6 13 56.25 |
| μ | + 10.49 | + 10.38 | | + 10.20 |
| $\mu_o$ | + 10.48 | + 10.48 | + 10.48 | + 10.48 |
| Vb M | 5 47 5.76 | 5 28 43.90 | 5 58 27.66 | 6 13 56.53 |
| C. O | + .01 | − .10 | | − .28 |

Not 91

* Mar 14th For Procyon α Hydræ + ε Leonis See Page 92

** April 9th For Sirius and ε Leonis See Page 92

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1851 April 7th contin  April 9th  a = -.07 b = -.14 c = +.06 Rate +0.63 t₀ = 5.00

| | ε Geminorum +25° | ζ Geminorum +21° | δ Geminorum +22° | Moons 1st Limb |
|---|---|---|---|---|
| Mean | 6 34 35.00 | 6 55 13.28 | 7 11 10.40 | 8 00 40.01 |
| Rate | +.17 | −.05 | −.05 | −.08 |
| a | −.01 | −.03 | −.03 | −.03 |
| b | −.15 | −.14 | −.14 | −.14 |
| c | +.07 | +.06 | +.06 | +.06 |
| | +.08 | −.14 | −.16 | −.19 |
| | 6 34 35.08 | 6 55 13.14 | 7 11 10.21 | 8 00 39.82 |
| | 6 34 45.40 | 6 55 15.81 | 7 11 13.01 12.99 | |
| | +10.32 | +2.67 | +2.80 | |
| | +10.48 | +2.98 | +2.98 | +2.91 55 |
| | 6 34 45.56 | 6 55 16.02 | 7 11 13.12 | 8 00 42.73 |
| | −.16 | +.21 | −.08 | |

1851 April 9th continued  April 11th  a = -.08 b = -.12 c = +.18 Rate +0.60 t₀ = 9.00

| | A Canceri +19° | δ Canceri +19° | ζ Leonis +12° | ε Leonis +24° |
|---|---|---|---|---|
| Mean | 8 23 02.97 | 8 36 10.30 | 9 23 53.57 | 9 37 21.98 |
| Rate | −.08 | −.09 | −.01 | −.02 |
| a | −.03 | −.03 | −.04 | −.03 |
| b | +.14 | −.11 | −.11 | −.12 |
| c | +.06 | +.06 | +.16 | +.17 |
| | −.19 | −.20 | .00 | .00 |
| | 8 23 2.78 | 8 36 10.10 | 9 23 53.57 | 9 37 21.98 |
| | 8 23 5.75 | 8 36 12.81 | 9 23 55.05 | 9 37 23.63 |
| | +2.97 | +2.71 | +1.48 | +1.65 |
| | +2.94 58 | +2.94 38 | +1.66 | +1.66 |
| | 8 23 5.69 66 | 8 36 12.81 2.98 | 9 23 55.23 | 9 37 25.64 |
| | +.06 09 | −.20 17 | +.18 | −.01 |

* April 9th For Procyon, β Gem, ε Hydrae, α Cephei, β Cephei, ε Leonis + α Leonis See Page 92 & 93

** April 11th For α Aurigae β Tauri δ Orionis ε Orionis & ζ Orionis See Page 93

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1857 April 11 contin  a=  b=  c=  Rate +0.60  $t_o$=

| | α Leonis + 13° | Moons 1st Limb | ρ Leonis +10° | April 12th α Leonis + 13° |
|---|---|---|---|---|
| Mean | 10 ⁿ 00 ⁿ 24.87 | 10 ⁿ 03 ⁿ 14.13 | 10 ⁿ 24 ⁿ 56.85 | 10 00 25.43 |
| Rate | − .03 | − .03 | − .03 | .00 |
| a | − .04 | − .04 | − .04 | − .04 |
| b | − .11 | − .11 | + 10 | − .11 |
| c | + .16 | + .16 | + .16 | + .13 |
| | − .02 | − .02 | − .01 | − .02 |
| | 10 0 24.85 | 10 3 14.11 | 10 24 56.84 | 10 00 25.41 |
| | 10 0 26.53 | | 10 24 58.44 | 10 00 26.52 |
| | +1.68 | | +1.60 | + 1.11 |
| | + 1.66 | + 1.66 | + 1.64 | + 1.23 |
| | 10 0 26.51 | 10 3 15.77 | 10 24 58.50 | 10 00 26.64 |
| | + .02 | | − .06 | − .12 |

9ⁿ.00
60t$_o$=

1857 April 12th con  a = −.08  b = −.12  c = +.13  Rate = +0.28  $t_o$ = 10ⁿ.00

* *

| | ρ Leonis +10° | Moons 1st Limb | σ Leonis +7° | τ Leonis +4° |
|---|---|---|---|---|
| Mean | 10 ⁿ 24 ⁿ 57.08 | 11 ⁿ 02 ⁿ 43.90 | 11 ⁿ 13 ⁿ 26.98 | 11 ⁿ 20 ⁿ 16.24 |
| Rate | − .00 | − .01 | .01 | − .01 |
| a | − .04 | − .04 | − .05 | − .05 |
| b | − .10 | − .10 | − .10 | − .09 |
| c | + .13 | + .13 | + .13 | + .13 |
| | − .01 | − .01 | − .02 | − .01 |
| | 10 24 57.07 | 11 02 43.89 | 11 13 26.96 | 11 20 16.23 |
| | 10 24 58.43 | | 11 13 27.94 | 11 20 17.32 |
| | + 1.36 | | + .98 | + 1.09 |
| | + 1.23 | + 1.23 | + 1.23 | + 1.23 |
| | 10 24 58.20 | 11 02 45.12 | 11 13 28.19 | 11 20 17.46 |
| | + .13 | | + .25 | − .14 |

4 73 * *  April 12th For α Aurigæ, β Tauri. δ Orionis. ε Orionis, Procyon. β Gem. α Hydræ ε Leonis See Page 94

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56

1857 June 5th  a = +.11  b = −.01  c = +.09  Rate +0.05  $t_0$ = 9.. 00

*

| | π Leonis +9° | α Leonis +13° | Moons 1st Limb | δ Leonis +21° |
|---|---|---|---|---|
| Mean | 9 .. 52 . 04 . 94 | 10 .. 00 .. 10.68 | 10 .. 24 .. 38.64 | 11 .. 05 .. 55.80 |
| Rate | 00 | 00 | 00 | 00 |
| a | +.06 | +.06 | +.06 | +.04 |
| b | −.01 | −.01 | −.01 | −.01 |
| c | +.09 | +.09 | +.09 | +.09 |
| | 9 52 5.08 | 10 00 10.82 | 10 24 38.82 | 11 5 55.92 |
| | 9 52 20.07 | 10 00 25.84 | | 11 6 10.96 |
| | + 14.95 | + 15.02 | | + 15.04 |
| | + 15.15 | + 15.15 | + 15.15 | + 15.15 |
| | 9 52 20.23 | 10 00 25.97 | 10 24 53.97 | 11 6 11.07 |
| | − .16 | − .13 | | − .11 |

1857 June 10th  a = +.09  b = −.02  c = +.11  Range +1.38  $t_0$ = 14h 00

**

| | κ Virginis −10° | Moons 1st Limb | β Libræ −9° | ζ Libræ −16° |
|---|---|---|---|---|
| Mean | 14 .. 04 .. 39.03 | 14 .. 59 .. 04.39 | 15 .. 07 .. 41.41 | 15 .. 19 .. 33.79 |
| Rate | 00 | +.06 | +.07 | +.08 |
| a | +.07 | +.07 | +.07 | +.08 |
| b | −.01 | −.01 | −.01 | −.01 |
| c | +.11 | +.11 | +.11 | +.12 |
| | +.17 | +.23 | +.24 | +.27 |
| | 14 4 39.20 | 14 59 4.62 | 15 8 41.65 | 15 19 34.06 |
| | 14 4 58.55 | | 15 9 1.28 | 15 19 53.34 |
| | + 19.35 | | 19.63 | + 19.28 |
| | + 19.29 | + 19.29 | + 19.29 | + 19.29 |
| | 14 4 58.49 | 14 59 23.91 | 15 9 0.94 | 15 19 53.35 |
| | + .06 | | + 0.34 | − .01 |

* June 5th For α Hydræ & β Librae See Page 95

** June 10th For η Bootis & Arcturus See Page 95

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1857 June 10th contin July 5th a = +.20 b = +.07 c = +.09 Rate ~~-2.95~~ -3.36 $t_0$ = 12.00

| | γ Librae −14° | γ Virginis +.00° | γ Virginis −1° | Moons 1st Limb |
|---|---|---|---|---|
| Mean | 15 26 54.04 | 12 10 18.30 | 12 32 07.96 | 12 52 57.99 |
| Rate | +.09 | +.02 | +.07 | +.13 |
| a | +.08 | +.14 | +.14 | +.14 |
| b | −.01 | +.05 | +.05 | +.05 |
| c | +.11 | +.09 | +.09 | +.09 |
| | +.27 | +.30 | +.35 | +.40 |
| | 15 26 54.31 | 12 10 18.60 | 12 32 8.31 | 12 52 57.99 |
| | 15 27 13.51 | 12 12 17.35 | 12 34 7.33 | ~~13 2 55.07~~ |
| | +19.20 | +1 58.75 | +1 59.02 | +1 |
| | +19.29 | +1 58.93 | +1 58.93 | +1 58.93 |
| | 15 27 13.60 | 12 12 17.53 | 12 34 7.24 | 12 54 56.92 |
| | −.09 | −.18 | +.09 | |

1857 July 5th contin July 7th * a = +.21 b = +.08 c = +.09 Rate -3.42 $t_0$ = ~~12.00~~ 13

| | γ Virginis +.00° | κ Virginis −10° CWT | λ Virginis −13° 1763 | Moons 1st Limb 1845 |
|---|---|---|---|---|
| Mean | 13 25 07.87 | 14 02 57.74 | 14 08 57.80 | 14 40 4.76 |
| Rate | +.19 | ~~+.15~~ | ~~+.16~~ | +.24 |
| a | +.14 | +.17 | +.18 | +.17 |
| b | +.05 | +.05 | +.05 | +.05 |
| c | +.09 | +.09 | +.09 | +.09 |
| | +.47 | +.46 | +.48 | +.55 |
| | 13 25 8.34 | 14 2 52.20 | 14 8 58.28 | 14 40 5.31 |
| | 13 27 7.15 | 14 4 58.34 | 14 11 4.44 | |
| | +1 58.79 | +2 6.14 | +2 6.16 | |
| | +1 58.93 | +2 6.04 | +2 6.04 | +2 6.04 |
| | 13 27 7.27 | 14 4 58.24 | 14 11 4.32 | 14 42 11.35 |
| | −.12 | +.10 | +.12 | |

** July 5th For β Corvi & 12 Com Vir See Page 95

* July 7th For β Leonis, Spica, γ Bootis, Arcturus, ε Bootis, α Serpentis, β Scorpii See Page ~~4~~ 5 Book B.

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56

1857 July 7th contin  July 11th  a = +.23  b = +.08  c = +.09  Rate −6.0  $t_0$ 17.00

| | β Librae. | 4 Sagittarii | μ' Sagittarii | Moons 1st Limb |
|---|---|---|---|---|
| Mean | 15 ⁿ 06 ᵐ 54.58 | 17 ⁿ 48 ᵐ 05.69 | 18 ⁿ 02 ᵐ 15.0 | 18 ⁿ 21 ᵐ 55.83 |
| Rate | + .26 | + .20 | + .26 | + .34 |
| a | + .17 | + .23 | + .22 | + .22 |
| b | + .05 | + .04 | + .04 | + .04 |
| c | + .04 | + .10 | + .10 | + .10 |
| | + .66 | + .57 | + .62 | + .70 |
| | 15 6 55.19 | 17 48 6.26 | 18 2 15.62 | 18 21 56.53 |
| | 15 9 05.47 | 17 50 43.90 | 18 4 53.38 | |
| | + 2 5.98 | 22 37.64 | 22 37.76 | |
| | + 2 6.04 | 2 37.85 | 2 37.85 | 2 37.85 |
| | 15 9 1.23 | 17 50 44.11 | 18 4 53.47 | 18 24 34.38 |
| | − .06 | − .21 | − .09 | |

1857 July 20/21 AM  a =  b =  c =  Rate =  $t_0$ =

| | μ Piscium | Moons 2nd Limb | α Arietis | α Ceti |
|---|---|---|---|---|
| Mean | 1 ⁿ 20 ᵐ 45 .83 | 1 ⁿ 57 ᵐ 07.30 | 1 ⁿ 57 ᵐ 09.91 | 2 ⁿ 52 ᵐ 52.25 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

In Chron Ex

* July 11th For α Geminis, Arcturus, α Cor Bor, α Herculis α Ophiuchi α Lyrae See Page 56 Book B.

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1851 July 21/22 | a = | b = | c = | Rate | $t_o$ =

| | ε Arietis. | γ Ceti. | Moon's 11th Limb | α Ceti. |
|---|---|---|---|---|
| Mean | 1..57..14.17 | 2..34..02.07 | 2..38..27.42 | 2..52..56.63 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

July 21/22 contin. | Aug 5th | a = | b = | c = | Rate | $t_o$ =

| | ε Persei. | θ Librae | Moons 1st Limb | χ Ophiuchi |
|---|---|---|---|---|
| Mean | 3..13..9.76 | 15..45..00.43 | 16..14..35.87 | 16..18..03.50 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Aug 5th For γ Urs maj. ψ Urs maj ψ Bootis Arcturus, ε Bootis, α² Librae β Urs min. β Librae, α Cor Bor, ε Serpentis, See Page 6 Book B.

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60

1857 Aug 5th contin | Aug 6th. a = | b = | c = | Rate | to =

* | φ Ophiuchi | χ Ophiuchi | Moon's 1st Limb | θ Ophiuchi

Mean | 16.22.16.84 | 16..18..09.33 | 17..00..14.48 | 17..12..37.76

Rate | 1

a

b

c

1857 Aug 6th contin | Aug 8th a = | b = | c = | Rate | to =

* * | β Ophiuchi | μ' Sagittarii | λ Sagittarii | π Sagittarii

Mean | 17..17..02.41 | 18..04..48.96 | 18..18..44.38 | 19..00..54.07

Rate

a

b

c

* Aug 6th For ε Virginis — ε Bootis, β Libræ, β Scorpii δ Ophiuchi ω Ophiuchi γ Draconis See Page 8 Book B

* * Aug 8th For α Lyræ, β Lyræ γ Aquilæ See Page 9 Book B.

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1857 Aug 9th continued

Aug 9th a = b = c =

| | Moons 1st limb | ρ' Sagittarii | π Sagittarii | δ' Sagittarii |
|---|---|---|---|---|
| Mean | 19..01..54.93 | 19..12..59.76 | 19..00..58.24 | 19..13..06.00 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Aug 9th contin Rates $t_0$ =

| * | Moons 1st Limb | β Capricorni | ρ Capricorni |
|---|---|---|---|
| Mean | 19..56..36.57 | 20..12..42.64 | 20..20..26.13 |
| Rate | | | |
| a | | | |
| b | | | |
| c | | | |

*B * Aug 9th Tor ζ Aquilae, δ Aquilae, γ Aquilae, α Aquilae β Aquilae. α Capricorni See Page 9 Book B.

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1857 Aug 19/20 a= b= c= Rate t₀=

| | α Persei | ε Tauri | η Tauri | Moon's 11th Limb |
|---|---|---|---|---|
| Mean | 3 " 16 " 55.14 | 3 " 20 " 17.84 | 3 " 39 " 50.25 | 4 " 03 " 55.27 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Aug 19/20 continued

| * | α Tauri | β Tauri | 4E Orionis | ε Orionis |
|---|---|---|---|---|
| Mean | 4 " 28 " 34.41 | 5 " 18 " 04.53 | 5 " 29 " 57.07 | 5 " 48 " 18.14 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Aug 19/20 For δ Orionis See Page 10 Book B

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1857 Sept 6th. a= b= c= Rate t₀=

| | * | a Capricorni | β Capricorni | ν Capricorni | Moon's 1st Limb |
|---|---|---|---|---|---|
| Mean | | 20 ,, 08 ,, 58.94 | 20 ,, 11 ,, 52.33 | 20 ,, 30 ,, 45.97 | 20 ,, 32 ,, 01.01 |
| Rate | | | | | |
| | a | | | | |
| | b | | | | |
| | c | | | | |

1857 Sept 6th continued Sept 15/16 a= b= c= Rate- t₀=

| | ϒ Capricorni | α Persei | σ Tauri | f Tauri |
|---|---|---|---|---|
| Mean | 20 ,, 36 ,, 28.43 | 3 ,, 12 ,, 48.37 | 3 ,, 15 ,, 53.10 | 3 ,, 21 ,, 44.26 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Sept 6th For β Aquilae, 61 Cygni ζ Cygni β Aquarii ε Pegasi Lee Pag 10 Book B.

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1857 Sept 15/16 contin a = b = c = Rate $t_0$ =

| | η Tauri | Morris II Lamb | γ Tauri | δ Tauri |
|---|---|---|---|---|
| Mean | 3.37.43.20 | 3.43.09.11 | 4.10.24.05 | 4.14.35.54 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Sept 15/16 contin a

| | α Tauri | α Aurigae | δ Orionis | α Leporis |
|---|---|---|---|---|
| Mean | 4.26.27.47 | 5.01.46.27 | 5.23.26.13 | 5.25.13.90 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

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1857 Sept 15/16 contin

| | ε Orionis | a Orionis |
|---|---|---|
| Mean | 5.. 27.. 43.13 | 5.. 46.. 12.66 |
| Rate | | |
| a | | |
| b | | |
| c | | |

Oct 1st a b c

| | Moons 1st Limb | σ Sagittarii |
|---|---|---|
| | 18.. 24.. 45.66 | 18.. 54.. 59.98 |

* 1857 Oct 1st contin

| | π Sagittarii |
|---|---|
| Mean | 19.. 00.. 09.08 |
| Rate | |
| a | |
| b | |
| c | |

** Oct 5/6 a= b= c= Rate to=

| | i Aquarii | θ Aquarii | Moons 1st Limb |
|---|---|---|---|
| | 21.. 57.. 46.76 | 22.. 08.. 21.67 | 22.. 44.. 54.96 |

* Oct 1st a Herculis β Draconis γ Draconis, α Lyrae β Lyrae γ Aquilae See Page 10 Book B

** Oct 5/6 For Regulus, α Lyrae, ε Pegasi, ζ Pegasi α Pegasi See Page 11 & 12 Book B

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1857 Oct 6 contin  Oct 7th  a=  b=  c=  Rate  to

*

| | $\Psi^3$ Aquarii | $\phi$ Aquarii | $\Psi^3$ Aquarii | Moons 1st Limb |
|---|---|---|---|---|
| Mean | 23 ° 10 ° 36.30 | 23 ° 06 ° 01.16 | 23 ° 10 ° 37.24 | 23 ° 31 ° 26 .33 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Oct 7 contin  Nov 1st  a  b

| | 27 Piscium | 33 Piscium | $\nu$ Aquarii | 29 Capricorni |
|---|---|---|---|---|
| Mean | 23 ° 50 ° 27.57 | 23 ° 57 ° 07.30 | 21 ° 01 ° 45.76 | 21 ° 07 ° 47.24 |
| Rate | | | | |
| a | | | | |
| β | | | | |
| e | | | | |

* Oct 7th For Fomalhaut. α Pegasi α Andromedae γ Pegasi. See Page 12th Book B.

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1857 Nov 1st 10h c = Rate $t_o$ =

*

| | δ Capricorni | Moon's 1st Limb | ε Aquarii. | α Andromeda |
|---|---|---|---|---|
| Mean | 21 ″ 39 ″ 06.55 | 21 ″ 40 ″ 31.41 | 21 ″ 58 ″ 40.91 | 0 ″ 01 ″ 00.61 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Nov 6th a = b = c = Rate $t_o$ =

* *

| | 33 Ceti | 40 Ceti. | Moon's 1st Limb | o Piscium. |
|---|---|---|---|---|
| Mean | 1 ″ 03 ″ 06.17 | 1 ″ 09 ″ 33.81 | 1 ″ 33 ″ 11.44 | 1 ″ 37 ″ 44.21 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Nov 1st For α Cygni, ν Aquarii, 29 Capricorni, β Aquarii, ε Pegasi, γ Pegasi See Page 13 Book B.

* * Nov 6th For α Andromeda, γ Pegasi, α Cassiopeæ, β Ceti & 4' Ceti See Page 13 & 14 Book B.

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| | 1857 Dec 3rd | a = | b = | c = | Rate | $t_5$ = |
|---|---|---|---|---|---|---|
| * | B A C 205 | 20 Ceti | Moon's 1st Limb | | μ Piscium | |
| Mean Rate | 0 " 37 " 38.38 | 0 " 45 " 12.86 | | | 1 " 22 " 10.33 | |
| a | | | | | | |
| b | | | | | | |
| c | | | | | | |

| 1857 Dec 3 contin | ** Dec 4th | a = | b = | c = | Rate | $t_5$ = |
|---|---|---|---|---|---|---|
| o Piscium. | μ Piscium. | | o Piscium | | Moon's 1st Limb | |
| 1 " 37 " 21.27 | 1 " 22 " 11.06 | | 1 " 37 " 19.97 | | 2 " 00 " 53.11 | |

* Dec 3rd For α Andromedæ, γ Pegasi α Arietis See Page 14 Book B.

** Dec 4th For α Andromedæ, γ Pegasi, δ' Ceti, α Arietis & α Ceti See Page 14 Book B.

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1857 Dec 4th continued * Dec 5th " a= b

| | ξ² Ceti | ν Ceti | ξ² Ceti | ν Ceti. |
|---|---|---|---|---|
| Mean | 2 . 20 . . 02.86 | 2 . 27 . . 57.94 | 2 . 19 . . 59.08 | 2 . 27 . . 48.06 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Dec 5th contin c= Rate t₀=

| | Moons 1st Limb | o Tauri. | f Tauri. |
|---|---|---|---|
| Mean | 2 . . 48 . . 59.30 | 3 . . 16 . . 32.60 | 3 . . 22 . . 23.77 |
| Rate | | | |
| a | | | |
| b | | | |
| c | | | |

* Dec 5th For a Arietis, & Ceti See Page 15 Book B

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* 1857 Dec 6th a= b= c= Rate $t_o$=

| | | | |
|---|---|---|---|
| | o Tauri | f Tauri | Moons 1st Limb |
| Mean | 3.16.27.31 | 3.22.18.50 | 3.39.39.16 |
| Rate | | | |
| a | | | |
| b | | | |
| c | | | |

* * 1851 Dec 29th a= b= c= Rate $t_o$=

| | | | |
|---|---|---|---|
| | 27 Piscium | 30 Piscium | Moons 1st Limb | 12 Ceti |
| | 23.49.04.36 | 23.52.20.68 | 0.08.40.34 | 0.20.27.90 |

* Dec 6th For γ Ceti, α Ceti See Page 15 Book B

* * Dec 29th For ζ Pegasi α Pegasi α Andromedæ γ Pegasi, α Cassiopeæ, β Ceti, α Arietis See Page 16 Book B.

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1851 Dec 29th continued * Dec 30th a= b= c= Rate to=

1852 Jan 1st

| | 13 Ceti. | 12 Ceti | Moons 1st Limb | & Piscium |
|---|---|---|---|---|
| Mean | 0 „ 25 „ 36.52 | 0 „ 20 „ 24.61 | 0 „ 53 „ 40.21 | 1 „ 52 „ 11.73 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1852 Jan 1st a= b= c Rate to=

* *

| | ζ' Ceti | Moons 1st Limb | 845 B.A.C. | π Arietis. |
|---|---|---|---|---|
| Mean | 2 „ 02 „ 58.01 | 2 „ 25 „ 43.13 | 2 „ 34 „ 45.15 | 2 „ 38 „ 50.73 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Dec 30th For α Andromedæ, γ Pegasi, α Cassiopeæ β Ceti See Page 17th Book B.

* * Jan 1st For ζ' Ceti π Arietis τ Ceti ν α Persei See Page 17th Book B.

B.

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7/2

1852 Jan 2nd "  a =  b =  c =  Rate =  $t_o$ =

| | | | |
|---|---|---|---|
| π Arietis | Moons 1st Limb | ε Tauri | λ Tauri. |
| 2 " 38 " 47. 48 | 3 " 14 " 41. 04 | 3 " 37 " 54 . 57 | 3 " 50 " 14. 29 |

1852 Jan 27th  a = -.35  b = -.15  c = +.14 (+3°)  Rate -3'5  $t_o$ = 0h 0m

| | 20 Ceti | ε Piscium | Moons 1st Limb | o Piscium (+8°) |
|---|---|---|---|---|
| Mean | 0 " 41 " 36. 64 | . . . . | 1 " 18 " 21. 41. | 1 " 33 " 45. 04 |
| Rate | + .10 | | + .19 | + .23 |
| a | - .25 | | - .22 | - .20 |
| b | - .11 | | - .11 | - .12 |
| c | + .14 | | + .14 | + .14 |
| | -.12 | | . 00 | + .05 |
| | 0 41 36.52 | | 1 18 21.41 | 1 33 45.09. |
| | 0 45 25.42 | | | 1 37 34.04 |
| | - 3 48.90 | | | - 3 48.95 |
| | - 3 48.97 | | - 3 48.97 | - 3 48.97 |
| Ob. R. | 1 0 45 25.49 | | 1 22 10.38 | 1 37 34.0 |
| C-O | - .07 | | | - .02 |

Jan 2nd For α Arietis & Ceti, α Persei ν Tauri See Page 18 Book B
Jan 27th For α Cassiopeæ β Ceti, ζ Ceti & Arietis See Page 18 Book B.

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1852 Jan 29th a = -.35 b = -.14 c = +.14 Rate -3s t₀ = 1h 00m

*

| | +8° ξ² Ceti | +9° 845 B.A.C. | +12° Moon's 1st Limb | +19° δ Arietis. ~~a Persei.~~ |
|---|---|---|---|---|
| | 2 16 21.18 | 2 32 59.96 | 2 50 59.96 | 2 59 13.71 |
| Rate | + .18 | + .22 | + .26 | + .29 |
| a | - .20 | - .19 | - .18 | - .15 |
| b | - .12 | - .12 | - .12 | - .14 |
| c | + .14 | + .14 | + .14 | + .14 |
| | .00 | + .05 | + .10 | + .14 |
| | 2 16 21.18 | 2 33 0.01 | 2 51 0.06 | 2 59 13.85 |
| | 2 20 17.02 | 2 36 56.14 | | 3 3 9.83 |
| | - 3 55.84 | - 3 56.13 | | - 3 55.98 |
| | - 3 55.80 | - 3 55.80 | - 3 55.80 | - 3 55.80 |
| Obs. | 2 20 16.98 | 2 36 55.81 | 2 54 55.86 | 3 3 9.65 |
| c-o | - .04 | + .33 | | + .18 |

1852 Feb 25th a = -.30 b = -.08 c -.17 Rate -1s t₀ = 2h 00m

**

| | Moon's 1st Limb | α Ceti | α Persei | η Tauri. |
|---|---|---|---|---|
| | 2 36 25.28 | 2 54 43.60 | 3 13 57.23 | 3 38 52.43 |
| Rate | + .04 | + .05 | + .17 | + .10 |
| a | - .16 | - .19 | + .06 | - .11 |
| b | - .07 | - .06 | - .12 | - .08 |
| c | - .17 | - .17 | - .26 | - .19 |
| | - .36 | - .37 | - .25 | - .28 |
| | 2 36 24.92 | 2 54 43.23 | 3 13 56.98 | 3 38 52.15 |
| | | 2 54 31.87 | 3 13 45.69 | 3 38 40.90 |
| | | + 11.36 | + 11.29 | + 11.25 |
| | + 11.32 | + 11.32 | + 11.32 | + 11.32 |
| | 36 [illegible] | 2 54 31.91 | 3 13 45.66 | 3 38 40.83 |
| c-o | | - .04 | + .03 | - .07 |

* Jan 29th For δ Ceti. α Arietis α Persei 17 Tauri See Page 19th Book B.

** Feb 25th For χ Eridani See Page 19th Book B.

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1852 Feb 27th  a = −.31  b = −.07  c = −.18  Rate −1'6  $t_0$ = 3h 00m

*

| | λ Tauri | Moon's 1st Limb | ε Tauri | α Tauri. |
|---|---|---|---|---|
| Mean | 3 52 36.39 | 4 14 43.42 43 | 4 20 06.17 | 4 27 33.33 |
| Rate | + .06 | + .08 | + .09 | + .10 |
| a | − .16 | − .13 | − .13 | − .14 |
| b | − .06 06 | − .07 | − .07 | − .07 |
| c | − .18 | − .19 | − .19 | − .19 |
| | − .34 | − .31 | − .30 | − .30 |
| | 3 52 36.05 | 4 14 42.81 | 4 20 5.87 | 4 27 33.03 |
| | 3 52 28.41 | | 4 19 57.96 | 4 27 25.44 |
| | + 7.64 | | + 7.91 | + 7.59 |
| | + 7.59 | + 7.59 | + 7.59 | + 7.59 |
| | 3 52 28.46 | 4 14 35.22 | 4 19 58.28 | 4 27 25.44 |
| | − .05 | | − .32 | .50 |

1852 March 2nd  a = −.38  b = −.15  c = −.25  Rate  $t_0$ =

Rejected.

* *

| | 57 Geminorum | δ Geminorum | Moon's 1st Limb | δ Cancri. |
|---|---|---|---|---|
| Mean | 7 04 34.94 | 7 10 59.13 | 8 07 07.84 | 8 35 58.83 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

* Feb 27th For α Ceti α Persei See Page 19th Book B.

* * Mar 2nd For α Gem. α Canis Min. β Gem ε Hydræ α Cancri See Page 20 Book B.

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After this date the Time Stars and Moon Culminating stars were all copied 75

1852 March 2nd contin  Mar 25th  a = −.27  b = −.02  c = −.18  Rate −.12  $t_0 = 4^h 00^m$

| | ε Leonis | Moon's 1st Limb +17° | γ Tauri +15° | ε Tauri |
|---|---|---|---|---|
| Mean | 8 . 50 . 06 . 32 | 3 „ 55 „ 48.25 | 4 „ 10 „ 42.96 | 4 „ 26 „ 46.41 |
| Rate | | .00 | + .01 | + .02 |
| a | | − .11 | − .13 | − .12 |
| b | | − .02 | − .02 | − .02 |
| c | | − .04 | − .04 | − .04 |
| | | − .19 | − .19 | |
| | | − .32 | − .33 | − .31 |
| | | 3 55 47.93 | 4 10 42.63 | 4 26 46.10 |
| | | | 4 11 21.55 | 4 27 24.99 |
| | | | − 38.92 | − 38.89 |
| | | − 39.18 | − 39.18 | − 39.18 |
| | | 3 56 27.11 | 4 11 21.81 | 4 27 25.28 |
| | | | − .26 | − .29 |

1852 Mar 25th contin

Mar 26th +15°

| | ε Aurigae | β Orionis | β Tauri | γ Tauri. |
|---|---|---|---|---|
| | 5 „ 05 „ 06.10 | 5 „ 06 „ 46.36 | 5 „ 16 „ 17.00 | 4 „ 10 „ 41.88 |
| | + .05 | + .05 | + .06 | + .06 12 |
| | + .02 | − .21 | − .07 | − .13 |
| | − .03 | − .01 | − .02 | − .02 |
| | − .06 | − .04 | − .05 | − .04 |
| | − .26 | − .16 | − .24 | − .39 |
| | − .06 | | | |
| | − .02 | − .35 | | |
| | − .22 | | | |
| | 5 5 8.08 | 5 6 46.01 | 5 16 16.76 | 4 10 41.55 |
| | 5 5 45.22 | 5 7 25.27 | 5 16 55.98 | 4 11 21.53 |
| | − 39.14 | − 39.26 | − 39.22 | − 39.98 |
| | − 39.12 | − 39.18 | − 39.18 | − 4a32 |
| | 5 5 45.06 | 5 7 25.19 | 5 16 55.94 | 4 11 21.87 |
| | + .16 | + .08 | + .04 | − .34 |

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1852 Mar 26th contin a = −.27 b = −.02 c = −.18 Rate −½ $t_0 = 4^h 00^m$

| | ϕ Tauri | Moons 1st Limb +20° | ε Aurigae (Eastman) | β Orionis |
|---|---|---|---|---|
| Mean | 4 .. 26 .. 45.35 | 4 .. 47 .. 32.09 | | 5 .. 06 .. 45.17 |
| Rate | + .02 | + .04 | | + .06 |
| a | − .12 | − .11 | | − .21 |
| b | − .02 | − .02 | | − .01 |
| c | − .04 − .19 | − .04 − .19 | | − .04 − .18 |
| | − .31 | − .28 | | − .34 |
| | 4 26 45.04 | 4 47 31.81 | | 5 6 44.83 |
| | 4 27 24.97 | | | 5 7 25.27 |
| | − 39.93 | − 40.32 | | − 40.44 |
| | 4 27 40.32 | − 40.32 | | − 40.32 |
| | 4 27 25.36 | 4 48 12.13 | | 5 7 25.15 |
| | − .39 | | | + .12 |

1852 Mar 26 contin

| | β Tauri | δ Orionis | ε Orionis |
|---|---|---|---|
| Mean | 5 .. 16 .. 15.81 | 5 .. 23 .. 46.44 | 5 .. 28 .. 01.93 |
| Rate | + .06 | + .07 | + .07 |
| a | − .07 | − .18 | − .18 |
| b | − .02 | − .01 | − .01 |
| c | − .05 − .21 | − .04 − .18 | − .04 − .18 |
| | − .24 | − .20 | − .20 |
| | 5 16 15.57 | 5 23 46.14 | 5 28 1.63 |
| | 5 16 55.98 | 5 24 26.58 | 5 28 42.06 |
| | − 40.41 | − 40.42 | − 40.43 |
| | − 40.32 | − 40.32 | − 40.32 |
| | 5 16 55.89 | 5 24 26.46 | 5 28 41.95 |
| | + .09 | + .12 | + .11 |

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1852 April 1st  a = −.24  b = −.08  c = −.17  Rate = −.54  $t_0$ = 10h 50m

| | γ Leonis (+21°) | Moon's 1st Limb (+13°) | χ Leonis (+8°) | δ Leonis |
|---|---|---|---|---|
| Mean | 10 .. 10 .. 33.07 | 10 .. 39 .. 21.54 | 10 .. 56 .. 07.41 | 11 .. 04 .. 58.52 |
| Rate | + .02 | + .07 | + .09 | + .11 |
| a | − .09 | − .12 | − .14 | − .09 |
| b | − .08 | − .07 | − .07 | − .08 |
| c | − .18 | − .18 | − .17 | − .18 |
| | − .33 | − .30 | − .29 | − .24 |
| | 10 10 32.74 | 10 39 21.24 | 10 56 07.12 | 11 4 58.30 |
| | 10 11 49.05 | | 10 57 23.61 | 11 6 14.78 |
| | − 1 16.31 | | − 1 16.49 | − 1 16.48 |
| | − 1 16.52 | − 1 16.52 | − 1 16.52 | − 1 16.52 |
| | 10 11 49.26 | 10 40 37.76 | 10 57 23.64 | 11 6 14.82 |
| | − .21 | | − .03 | − .04 |

1852 April 1st continued  −

| | δ Hydrae et Crat (+11°) | ε Leonis | δ Cancri | ε Hydrae |
|---|---|---|---|---|
| Mean | 11 .. 10 .. 41.30 | 11 .. 14 .. 57.06 | 8 .. 36 .. 24.98 | 8 .. 39 .. 04.98 |
| Rate | + .12 | + .12 | − .02 | − .02 |
| a | − .21 | − .13 | − .09 | − .12 |
| b | − .05 | − .07 | − .12 | − .10 |
| c | − .18 | − .17 | − .23 | − .22 |
| | − .32 | − .25 | − .46 | − .46 |
| | 11 10 40.98 | 11 14 56.81 | 8 36 24.52 | 8 39 4.52 |
| | 11 11 57.55 | 11 16 62.94 | 8 36 15.85 | 8 38 56.03 |
| | − 1 16.57 | − 1 16.13 | + 8.67 | + 8.49 |
| | − 1 16.52 | − 1 16.52 | + 8.65 | + 8.65 |
| | 11 11 57.50 | 11 16 13.33 | 8 36 15.87 | 8 38 55.67 |
| | + .05 | − .39 | − .02 | + .16 |

April 27th  a = − .21  b = −.12  (+19°)

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1852 April 27th con. $c = -.22$ Rate +07 $t_0 = 8^h 00^m$

| | α Cancri +12° | Moon's 1st Limb +19° | α Hydrae | ε Leonis. |
|---|---|---|---|---|
| Mean | 8 „ 50 „ 32.32 | 9 „ 16 „ 36.43 | 9 „ 20 „ 25.06 | 9 „ 37 „ 35.77 |
| Rate | − .03 | − .04 | − .04 | − .05 |
| a | − .11 | − .09 | − .16 | − .07 |
| b | − .11 | − .12 | − .08 | − .13 |
| c | − .23 | − .23 | − .22 | − .24 |
| | − .48 | − .48 | − .50 | − .49 |
| | 8 50 31.84 | 9 16 35.95 | 9 20 24.56 | 9 37 35.28 |
| | 8 50 23.19 | 1 | 9 20 14.96 | 9 27 26.75 |
| | + 8.65 | | + 8.60 | + 8.53 |
| | + 8.65 | + 8.65 | + 8.65 | + 8.65 |
| | 8 50 23.19 | 9 16 27.30 | 9 20 18.91 | 9 37 26.63 |
| | .00 | | + .05 | + .12 |

1852 April 27th contin

| | ν Leonis +13° | γ Leonis +17° | α Leonis. |
|---|---|---|---|
| Mean | 9 „ 50 „ 24.84 | 9 „ 59 „ 25.13 | 10 „ 00 „ 38.92 |
| Rate | − .05 | − .06 | − .06 |
| a | − .11 | − .09 | − .11 |
| b | − .11 | − .11 | − .11 |
| c | − .23 | − .23 | − .23 |
| | − .50 | − .49 | − .51 |
| | 9 50 24.34 | 9 59 24.64 | 10 00 38.41 |
| | 9 50 15.49 | 9 59 15.72 | 10 00 29.43 |
| | + 8.85 | + 8.92 | + 8.95 |
| | + 8.65 | + 8.65 | + 8.65 |
| | 9 50 15.69 | 9 59 15.99 | 10 0 29.78 |
| | + .20 | − .27 | − .25 |

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1852 April 24th. $a = -.20$ $b = -.11$ $c = -.21$ Rate 10 $t_0 = +9^h 00^m$

| | ε Leonis | | ν Leonis | | γ Leonis | | α Leonis | |
|---|---|---|---|---|---|---|---|---|
| | | | +13° | | +17° | | | |
| Mean | 9 | 36 02.24 | 9 | 48 50.95 | 9 | 57 57.47 | 9 | 59 05.04 |
| Rate | | .00 | | .00 | | .00 | | .00 |
| a | | −.07 | | −.10 | | −.09 | | −.10 |
| b | | −.12 | | −.10 | | −.10 | | −.10 |
| c | | −.23 | | −.21 | | −.22 | | −.26 |
| | | −.42 | | −.41 | | −.41 | | −.46 |
| | 9 | 36 1.82 | 9 | 48 50.54 | 9 | 57 57.06 | 9 | 59 4.58 |
| | 9 | 37 26.73 | 9 | 50 15.48 | 9 | 59 15.71 | 10 | 0 29.42 |
| | − 1 | 24.91 | − 1 | 24.94 | − 1 | 24.65 | − 1 | 24.84 |
| | − 1 | 24.87 | − 1 | 24.87 | − 1 | 24.87 | − 1 | 24.87 |
| | 9 | 37 26.69 | 64¾ 9 | 50 15.41 | 9 | 59 15.93 | 10 | 0 29.45 |
| | | +.04 | | +.07 | | −.22 | | −.03 |

1852 April 24 continued

| | γ Leonis | | Moon's 1st Limb | | ρ Leonis | |
|---|---|---|---|---|---|---|
| | +21° | | +15° | | +16° | |
| | 10 | 10 24.45 | 10 | 13 16.98 | 10 | 23 36.99 |
| | | .00 | | .00 | | .00 |
| | | −.08 | | −.10 | | −.11 |
| | | −.11 | | −.10 | | −.09 |
| | | −.22 | | −.22 | | −.21 |
| | | −.41 | | −.42 | | −.41 |
| | 10 | 10 24.04 | 10 | 13 16.56 | 10 | 23 36.58 |
| | 10 | 11 48.73 | | | 10 | 25 1.32 |
| | − 1 | 24.69 | | | − 1 | 24.74 |
| | − 1 | 24.87 | − 1 | 24.87 | − 1 | 24.87 |
| | 10 | 11 48.91 | 10 | 14 41.43 | 10 | 25 1.45 |
| | | −.18 | | | | −.13 |

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1852 April 30th  a = −.18  b = −.11  c = −.20  Rate −1ᵍ  ts = 11ʰ 00ᵐ

| | δ Leonis | δ Hyd et Crat | ι Leonis ±11° | ξ Virginis. +9° |
|---|---|---|---|---|
| Mean | 11ʰ 03ᵐ 47ˢ.93 | 11ʰ 09ᵐ 30ˢ.77 | 11ʰ 13ᵐ 46ˢ.46 | 11ʰ 35ᵐ 13ˢ.54 |
| Rate | + .00 | + .01 | + .02 | + .05 |
| a | − .07 | − .15 | − .10 | − .10 |
| b | − .11 | − .06 | − .10 | − .09 |
| c | − .21 | − .21 | − .20 | − .20 |
| | 11 3 47.72 | 11 9 30.56 | 11 13 46.26 | 11 35 13.24 |
| | 11 6 14.56 | 11 11 57.34 | 11 16 12.75 | 11 37 39.97 |
| | −2 26.84 | −2 26.78 | −2 26.49 | −2 26.63 |
| | −2 26.89 | −2 26.89 | −2 26.89 | −2 26.89 |
| | 11 6 14.64 | 11 11 57.45 | 11 16 13.15 | 11 37 40.23 |
| | − .05 | − .11 | − .40 | − .26 |

1852 April 30th continued

| | β Leonis | Moon's 1st Limb +4° | γ Virginis 0° | β Corvi. |
|---|---|---|---|---|
| Mean | 11ʰ 39ᵐ 04ˢ.58 | 12ʰ 06ᵐ 51ˢ.00 | 12ʰ 09ᵐ 54ˢ.74 | 12ʰ 24ᵐ 11ˢ.63 |
| Rate | + .05 | + .09 | + .09 | + .11 |
| a | − .08 | − .11 | − .12 | − .18 |
| b | − .10 | − .09 | − .08 | − .05 |
| c | − .21 | − .20 | − .20 | − .22 |
| | 11 39 4.27 | 12 6 50.80 | 12 09 54.54 | 12 24 11.41 |
| | 11 41 31.18 | | 12 12 20.87 | 12 26 38.29 |
| | −2 26.91 | | −2 26.23 | −2 26.88 |
| | −2 26.89 | −2 26.89 | −2 26.89 | −2 26.89 |
| | 11 41 31.16 | 12 9 17.69 | 12 12 21.43 | 12 26 38.30 |
| | + .02 | | − .56 | − .01 |

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1852 April 30th contin. — April 29th a = -.19 b = -.11 c = -.20 Rate +.52 to -10.01

| | 12 Can Ven | α Leonis | ρ Leonis | δ Leonis. |
|---|---|---|---|---|
| Mean | 12 „ 46 „ 40.37 | 9 „ 59 „ 05.32 | 10 „ 23 „ 37.14 | 11 „ 04 „ 50.40 |
| Rate | + .14 | .50 | .50 | − .07 |
| a | − .01 | − .10 | + .10 | − .07 |
| b | − .14 | − .10 | − .09 | − .11 |
| c | − .26 | − .20 | − .20 | − .21 |
| | 12 46 40.11 | 9 59 5.12 | 10 23 36.94 | 11 4 50.14 |
| | 12 49 7.13 | 10 0 29.40 | 10 25 1.30 | 11 6 14.54 |
| | − 2 27.02 | − 1 24.28 | | − 1 24.35 |
| | − 2 26.89 | − 1 24.35 | − 1 24.35 | − 1 24.35 |
| | 12 49 7.00 | 10 0 29.47 | 10 25 1.29 | 11 6 14.54 |
| | + .13 | − .07 | + .01 | .60 |

1852 April 29th continued

| | +10° Moons 1st Limb | +11° ι Leonis | +9° ξ Virginis | B Leonis. |
|---|---|---|---|---|
| | 11 „ 10 „ 48.12 | 11 „ 14 „ 48.93 | 11 „ 36 „ 15.87 | 11 „ 40 „ 06.98 |
| | − .01 | − .01 | − .01 | − .01 |
| | + .10 | + .10 | + .11 | − .09 |
| | − .09 | − .10 | − .09 | − .10 |
| | − .20 | − .20 | − .20 | − .21 |
| | 11 10 47.92 | 11 14 48.73 | 11 36 15.67 | 11 40 6.77 |
| | | 11 16 12.76 | 11 37 29.98 | 11 41 31.19 |
| | ~~− 1 24.35~~ | ~~− 1 24.03~~ | − 1 24.31 | − 1 24.42 |
| | − 1 24.35 | − 1 24.35 | − 1 24.35 | − 1 24.35 |
| | 11 12 12.27 | 11 16 13.08 | 11 37 40.02 | 11 41 31.12 |
| | | − .32 | − .04 | + .07 |

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f. 2

1852 May 25th a = −.08 b = −.03 c = −.18 Rate −2/3 $t_0$ = 9h 00m 00s

| | α Hydrae | ε Leonis | Moon's 1st Limb +17° | α Leonis |
|---|---|---|---|---|
| Mean | 9h 21m 58s.00 | 9h 39m 05s.64 | 9h 57m 15s.54 | 10h 02m 08s.19 |
| Rate | + .02 | + .04 | + .05 | + .06 |
| a | − .06 | − .03 | − .04 | − .04 |
| b | − .02 | − .03 | − .03 | − .03 |
| c | − .18 | − .20 | − .19 | − .18 |
| | 9 21 57.82 | 9 39 5.44 | 9 57 15.35 | 10 2 8.01 |
| | 9 20 18.59 | 9 37 26.35 | | 10 0 29.10 |
| | + 1 39.23 | + 1 39.09 | | + 1 38.91 |
| | + 1 38.98 | + 1 38.98 | + 1 38.98 | + 1 38.98 |
| | 9 20 18.84 | 9 37 26.46 | 9 55 36.37 | 10 0 29.03 |
| | − .30 25? | − .11 | | + .07 |

1852 May 25th continued

| | ρ Leonis +10° | δ Leonis | δ Hyd et Crt. |
|---|---|---|---|
| Mean | 10h 26m 40s.16 | 11h 07m 53s.30 | 11h 13m 36s.07 |
| Rate | + .08 | + .12 | + .13 |
| a | − .04 | − .03 | − .07 |
| b | − .03 | − .03 | − .02 |
| c | − .18 | − .19 | − .19 |
| | 10 26 39.98 | 11 7 53.11 | 11 13 35.88 |
| | 10 25 0.99 | 11 6 14.25 | 11 11 57.07 |
| | + 1 38.99 | + 1 38.86 | + 1 38.81 |
| | + 1 38.98 | + 1 38.98 | + 1 38.98 |
| | 10 25 1.00 | 11 6 14.13 | 11 11 56.90 |
| | − .01 | + .12 | + .17 |

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1852 May 26th  a = ~~-.11~~ -.08  b = -.03  c = -.19  Rate -2s  $t_0 = 10^h 00^m$

| | α Leonis | Moon's 1st Limb +12° | δ Leonis | δ Hydræ et Corvi |
|---|---|---|---|---|
| Mean | 10 " 02 " 05.93 | 10 " 53 " 26.01 | 11 " 07 " 51.03 | 11 " 13 " 33.80 |
| Rate | ~~0~~ .08 | + .05 | + .06 | + .06 |
| a | − .04 | − .04 | − .03 | − .07 |
| b | − .03 | − .03 | − .03 | − .02 |
| c | − .19 | − .19 | − .20 | − .20 |
| | 10 2 1.74 | 10 53 25.82 | 11 7 50.83 | 11 13 33.60 |
| | 10 0 29.07 | | 11 6 14.24 | 11 11 57.06 |
| | + 1 26.67 | | + 1 26.59 | + 1 26.54 |
| | + 1 26.66 | + 1 26.60 | + 1 26.60 | + 1 26.60 |
| | 10 0 29.14 | 10 51 49.22 | 11 6 16.23 | 11 11 57.00 |
| | − .07 | ~~0~~ | + .01 | + .06 |

1852 May 25th  a = ~~-.10~~ -.06  b = -.03  c = -.21  Rate -2s  $t_0 = 12^h 00^m$

| | β Leonis | o Virginis +10° | c Virginis +4° | Moon's 1st Limb +1° |
|---|---|---|---|---|
| Mean | 11 " 43 " 03.24 | 11 " 59 " 13.13 | 12 " 14 " 23.06 | 12 " 43 " 48.52 |
| Rate | + .09 | + .09 | + .14 | + .15 |
| a | − .03 | − .03 | − .04 | − .04 |
| b | − .03 | − .03 | − .02 | − .02 |
| c | − .22 | − .21 | − .27 | − .27 |
| | 11 43 3.02 | 11 59 12.92 | 12 14 22.85 | 12 43 48.33 |
| | 11 41 20.91 | 11 57 40.83 | 12 12 50.57 | |
| | + 1 32.11 | + 1 32.09 | + 1 32.88 | |
| | + 1 32.15 | + 1 32.15 | + 1 32.15 | + 1 32.15 |
| | 11 41 20.87 | 11 57 40.77 | 12 12 50.70 | 12 42 16.18 |
| | + .04 | + .06 | − .13 | |

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1852 May 28th continued

+4°

| | S Virginis | ϕ Virginis |
|---|---|---|
| Mean | 12h 49m 42.21 | 13h 18m 57.52 |
| Rate | + .16 | + .20 |
| a | − .04 | − .05 |
| b | − .02 | − .02 |
| c | − .21 | − .21 |
| | 12 49 42.00 | 13 18 57.33 |
| | 12 48 9.76 | 13 17 25.15 |
| | + 1 32.24 | + 1 32.18 |
| | + 1 32.15 | + 1 32.15 |
| | 12 48 9.85 | 13 17 25.48 |
| | −.09 | +.03 |

After this date the reductions are in the Transit Books containing the original Obs—

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# Supplement.

1850 Nov 13th a = −.06 b = +.05 c = +.14 Rate ~~+2.26~~ − 2.04 $t_0$ = ~~15h 00m~~ 21h 00m.

| | β Aquarii | α Aquarii | ζ Pegasi. |
|---|---|---|---|
| Mean | 21 . 23 . 37.91 | 21 . 58 . 08.20 | 22 . 33 . 57.63. |
| Rate | + .63 | + .79 | + .56 |
| a | − .04 | + .01 | − .03 |
| b | + .03 | + .04 | + .04 |
| c | + .14 | + .14 | + .14 |
| | + 16 | + 22 | + .28 |
| | ~~+ 29~~ | .35 | .41 |
| | 8.07 | 3.42 | 57.91 |
| | 21 23 ~~37.63~~ | 21 58 ~~2.86~~ | 22 33 ~~57.22~~ |
| | 21 23 41.26 | 21 58 6.56 | 22 34 1.03 |
| | − 3.64 | − 3.71 | − 3.81 |
| | − 3.72 | − 3.72 | − 3.72 |
| | 21 23 41.22 | 21 58 6.57 | 22 34 1.06 |
| | + .04 | − .01 | − .03 |

1850 Nov 14th a = −.07 b = +.05 c = +.16 Rate −2.21 $t_0$ = 23h 00m

| | β Lyrae | γ Aquilae | ζ Pegasi | ε Pegasi. |
|---|---|---|---|---|
| Mean | 18 . 46 . 26.64 | 19 . 39 . 04.55 | 22 . 33 . 54.46 | 22 . 57 . 13.38 |
| Rate | | | + .07 | + .09 |
| a | | | − .04 | − .03 |
| b | | | + .04 | + .05 |
| c | | | + .16 | + .16 |
| | | | + .23 | + .27 |
| | | | 22 33 54.69 | 22 57 13.60 |
| | | | 22 34 1.01 | 22 57 19.80 |
| | | | − 6.32 | − 6.20 |
| | | | − 6.16 | − 6.16 |
| | | | 22 34 0.83 | 22 57 19.76 |
| | | | + 1.16 | + 0.04 |

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1850 Dec 11th a = -.24 b = -.05 c = -.26 Rate = -2.78 $t_0$ = 22h 00m

Dec 13th a = -.33 b = -.04 c = -.27

| | α Aquarii | α Andromeda | ι Piscium | α Andromeda |
|---|---|---|---|---|
| Mean | 21.56.52.15 | 23h 59.28.70 | 23.30.59.15 | 23.59.23.65 |
| Rate | − .01 | + .35 .23 | + .05 | + .11 |
| a | − .16 | − .07 | − .20 | − .09 |
| b | − .04 | − .05 | − .03 | − .04 |
| c | − .26 | − .39 | − .27 | − .31 |
| | − .47 | − .26 .18 | − .45 | − .33 |
| | 21 56 53.68 | 23 59 28.52 | 23 30 58.73 | 23 59 23.32 |
| | 21 58 1.21 | 0 0 41.08 | 23 32 16.34 | 0 0 41.06 |
| | − 1 12.53 | − 1 12.56 | − 1 17.61 | − 1 17.74 |
| | − 1 12.54 | − 1 12.54 | − 1 17.65 | − 1 17.65 |
| | 21 58 1.22 | 0 0 41.06 | 23 32 16.35 | 0 0 40.97 |
| | − .01 | + .02 | − .01 | + .09 |

1850 Dec 13th Rate -2.55 $t_0$ = 23h 01m

| | γ Pegasi | α Arietis | β Ursæ Minæ |
|---|---|---|---|
| Mean | 0.04.16.18 | 1.57.29.43 | 2.49.47.24 |
| Rate | + .11 | + .31 | |
| a | − .16 | − .02 | |
| b | − .04 | − .04 | |
| c | − .28 | − .29 | |
| | − .37 | − .14 | |
| | 0 4 15.81 | 1 57 29.29 | |
| | 0 5 33.42 | 1 58 26.92 | |
| | − 1 17.61 | − 1 17.63 | |
| | − 1 17.65 | − 1 17.65 | |
| | 0 5 33.46 | 1 58 26.94 | |
| | − .04 | − .02 | |

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1850 Dec 14th a = -.38 b = -.06 c = -.27 Rate -2.75 to = 0h 00m Dec 18th a =

| | α Andromeda | γ Pegasi | β Ceti | α Andromeda |
|---|---|---|---|---|
| Mean | 23 h 59 m 20.48 | 0 h 04 m 13.10 | 0 h 34 m 45.45 | 23 h 59 m 09.33 |
| Rate | .00 | +.01 | + .07 | |
| a | − .10 | − .18 | − .25 | |
| b | − .07 | − .05 | − .03 | |
| c | − .20 | − .28 | − .29 | |
| | − .47 | − .50 | − .60 | |
| | 23 59 20.01 | 0 04 12.60 | 0 34 44.85 | |
| | 0 00 41.04 | 0 04 33.41 | 0 36 5.71 | |
| | − 1 21.03 | − 1 20.81 | − 1 20.86 | |
| | − 1 20.90 | − 1 20.90 | − 1 20.90 | |
| | 0 0 40.91 | 0 04 33.50 | 0 36 5.76 | |
| C-O | + .13 | − .09 | − .04 | |

1850 Dec 18th b = -.16 a = -.32 c = +.21 Rate -3.01 to = 4.00

| | γ Ceti | β Ars Min lower transit | β Orionis | δ Orionis |
|---|---|---|---|---|
| Mean | 2 h 34 m 05.21 | 2 h 54 m 37.14 | 5 h 05 m 51.24 | 5 h 22 m 52.15 |
| Rate | | | + .14 | +.17 |
| a | | | − .25 | −.22 |
| b | | | − .10 | − .12 |
| c | | | + .21 | +.21 |
| | | | .00 | +.04 |
| | | | 5 5 51.38 | 5 22 52.19 |
| | | | 5 7 23.18 | 5 24 24.20 |
| | | | − 1 31.80 | − 1 32.01 |
| | | | − 1 31.95 | − 1 31.95 |
| | | | 5 7 23.23 | 5 24 24.14 |
| | | | − .15 | + .06. |

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1850 Dec 26th a = b = c = Rate to =

| | δ Ceti | α Arietis | γ Ceti | β Urs Min. |
|---|---|---|---|---|
| Mean | 1 " 14 " 38.61 | 1 " 56 " 57.25 | 2 " 38 " 39.38 | 2 " 49 " 13.47 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1850 Dec 26/27 M.T. a = -.39 b = -.13 c = +.23 R = 258 L = 11h 00m 1857 Jan 11th

| | β Leonis | β Corvi | Spica | α Andromeda |
|---|---|---|---|---|
| Mean | 11 " 39 " 30.07 | 12 " 24 " 36.80 | 13 " 15 " 23.30 | 23 " 58 " 00.73 |
| Rate | + .07 | + .15 | | |
| a | - .18 | - .36 | | |
| b | - .12 | - .06 | | |
| c | + .24 | + .25 | | |
| | + .01 | - .04 | | |
| | 11 39 20.08 | 12 24 36.76 | | |
| | 11 41 26.64 | 12 26 33.24 | | |
| | + 1 56.53 | + 1 56.58 | | |
| | + 1 56.49 | + 1 56.49 | | |
| | 11 41 26.57 | 12 26 33.25 | | |
| | + .04 | + .09 | | |

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1857 Jan 11th a = −.35 b = −.09 c = +.25 Rate −2.62 $t_0$ = 1.00

| | ν Pegasi | φ Arietis | o Ceti. | π Arietis | |
|---|---|---|---|---|---|
| Mean | 0 .. 03 .. 53.21 | 1 .. 56 .. 06.50 | 2 .. 57 .. 49.35 | 2 .. 43 .. 18.77 | 38.2 |
| Rate | | + .10 | + .20 | + .19 | |
| a | | − .13 | − .22 | − .16 | |
| b | | − .09 | − .07 | − .09 | |
| c | | + .27 | + .25 | + .26 | |
| s. | | + .15 | + .16 | + .20 | |
| | | 1 56 6.65 | 2 57 49.57 | 2 43 18.97 | 38.2 |
| | | 1 58 46.61 | 2 57 29.57 | 2 40 58.83 | |
| | | + 2 39.96 | 2 40.03 | 2 39.86 | |
| | | + 2 40.00 | 2 40.00 | 2 40.00 | |
| | | 1 58 46.65 | 2 57 29.60 | 2 40 58.97 | |
| | | − .04 | + .03 | − .14 | |

1857 Jan 8th a = −.35 b = −.16 c = +.22 Rate +2.48 $t_0$ = 0h 00m

| | Moon's 1st Limb | 12 Ceti | α Cassiopeae (bad mean) | ν Pegasi. 16.20 |
|---|---|---|---|---|
| Mean | 23 .. 58 .. 41.13 | 0 .. 22 .. 08.55 | | 0 .. 05 .. ~~02.16~~ |
| Rate | − .00 | ~~− .01~~ | | + ~~.01~~ .00 |
| a | − .26 | − .26 | | − .17 |
| b | − .11 | − .11 | | − .15 |
| c | + .22 | + .22 | | + .23 |
| | − .15 | − .16 | | − .08 16.21 |
| | 23 58 40.98 | 0 22 8.39 | | 0 05 ~~02.08~~ |
| | | 0 22 25.12 | | 0 5 33.11 |
| | | + 16.73 | | + 16.90 |
| | + 16.90 | + 16.90 | | + 16.90 |
| | 23 58 57.88 | 0 22 ~~42.29~~ | | 0 5 33.11 |
| | | − .17 | | .00 |

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90

1857 Jan 13th a = −.34 b = −.05 c = +.27 Rate = −s.22 $t_o$ = 3.00.

| | α Andromeda | γ Pegasi | ε Cassiopeæ | β Ceti |
|---|---|---|---|---|
| Mean | 23.57.55.63 | 47.98 | 0.31.49.63 | 0.35.57.41 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Jan 13 continued

| | α Orionis | μ Gem. |
|---|---|---|
| Mean | 5.53.14.13 | 6 11.11.28 |
| Rate | + .03 | + .03 |
| a | − .20 | − .12 |
| b | − .04 | − .05 |
| c | + .27 | + .29 |
| | + .06 | + .15 |
| | 5 53 14.19 | 6 11 11.43 |

Feb 7th a = b =

| | γ Ceti | β Orionis |
|---|---|---|
| | 2.35.21.52 | 5.06.09.67 |

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1857 Feb 7th  c =  Rate  $t_o$ =

| | β Tauri | δ Orionis | α Leporis | ε Orionis |
|---|---|---|---|---|
| Mean | 5 " 16 " 39.57 | 5 " 24 " 10.77 | 5 " 25 " 56.72 | 5 " 28 " 26.77 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 Feb 7th continued  Feb 11th  a = -.25  b = -.11  c = +.12  Rate -.22  $t_o$ = 4.00

| | α Orionis | β Orionis | δ Orionis | ε Orionis |
|---|---|---|---|---|
| Mean | 5 " 46 " 53.37 | 5 " 07 " 10.94 | 5 " 24 " 11.68 | 5 " 28 " 27.20 |
| Rate | | + .01 | + .01 | + .01 |
| a | | − .20 | − .17 | − .17 |
| b | | − .07 | − .08 | − .08 |
| c | | + .12 | + .12 | + .12 |
| S. | | − .14 | − .12 | − .12 |
| | | 5 07 10.80 | 5 24 11.66 | 5 28 27.08 |
| | | 5 07 22.90 | 5 24 24.03 | 5 28 39.52 |
| | | + 12.10 | + 12.54 | + 12.44 |

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1857 Feb 11th continued  Mar 14th  a = -.22  b = -.16  c = +.17  Rate +0.36  $t_o$ = 8h 00m

| | ε Orionis | Procyon | ε Hydrae | ε Leonis |
|---|---|---|---|---|
| Mean | 5h 46m 52.24 | 7h 31m 24.24 | 9h 20m 10.54 | 9h 37m 17.81 |
| Rate | + .02 | + .01 | - .02 | - .02 |
| a | - .14 | - .13 | - .17 | - .07 |
| b | - .09 | - .13 | - .10 | - .17 |
| c | + .12 | + .17 | + .17 | + .19 |
| S. | - .09 | - .08 | - .12 | - .07 |
| | 5 46 54.15 | 7 31 24.16 | 9 20 10.42 | 9 37 17.74 |
| | 5 47 6.69 | 7 31 30.30 | 9 20 16.72 | 9 37 23.93 |
| | + 12.54 | + 6.14 | + 6.30 | + 6.19 |
| | | + 6.26 | + 6.26 | + 6.26 |
| | | 7 31 30.42 | 9 20 16.68 | 9 37 24.00 |
| | | - .12 | + .04 | - .07 |

1857 April 7th a = -.07  b = +.14  c = +.06  Rate 2.54  $t_o$ = 5h 00m

April 9th  a = -.07  b = -.14

| | Sirius | ε Leonis | Procyon | β Geminorum |
|---|---|---|---|---|
| Mean | 6h 38m 24.23 | 10h 00m 15.53 | 7h 31m 27.08 | 7h 36m 08.18 |
| Rate | + .17 | | + 0.07 | + .07 |
| a | - .06 | | - 0.04 | + .02 |
| b | - .07 | | - 0.11 | - .15 |
| c | + .06 | | + 0.06 | + .07 |
| | + .10 | | - 0.02 | - .03 |
| | 6 38 24.33 | | 7 31 27.06 | 7 36 8.15 |
| | 6 38 35.09 | | 7 31 29.86 | 7 36 11.34 |
| | +10.76 | | + 2.80 | + 3.19 |
| | + 10.48 | | + 2.77 88 | + 2.94 88 |
| | 6 38 34.81 | | 7 31 29.97 74 | 7 36 11.13 3 |
| | + 0.28 | | - .11 08 | + .28 31 |

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1857 April 9th  c = + .06  Rate +0.63  $t_o$ = 5h 00m

| | ε Hydrae | ε Cephei | β Cephei | ε Leonis |
|---|---|---|---|---|
| Mean | 8 38 50.48 | 9 14 57.98 | 9 26 39.54 | 9 37 20.64 |
| Rate | + .10 | | | + .12 |
| a | − .04 | | | − .02 |
| b | − .11 | | | − .15 |
| c | + .06 | | | + .07 |
| | + .01 | | | + .02 |
| | 8 38 50.49 | | | 9 37 20.66 |
| | 8 38 53.24 | | | 9 37 23.66 |
| | + 2.75 (85) | | | + 3.00 (88) |
| | + 2.91 | | | + 2.91 (84) |
| | 8 38 53.40 (37) | | | 9 37 23.57 |
| | − .16 (13) | | | + .09 (12) |

1857 April 9th contin  April 11th a =  b =  c =  Rate  $t_o$ =

| | α Leonis. | α Aurigae | β Tauri | δ Orionis |
|---|---|---|---|---|
| Mean | 10 00 23.76 | 5 05 37.84 | 5 16 49.54 | 5 24 21.04 |
| Rate | + .13 | | | |
| a | − .04 | | | |
| b | − .12 | | | |
| c | + .06 | | | |
| | + .03 | | | |
| | 10 00 23.79 | | | |
| | 10 00 26.55 | | | |
| | + 2.76 | | | |
| | + 2.88 | | | |
| | 10 00 26.67 | | | |
| | − .12 | | | |

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1857 April 11th continued — April 12th a = b =

| | ε Orionis | σ Orionis. | α Aurigae | β Tauri. |
|---|---|---|---|---|
| Mean | 5ʰ 28ᵐ 36.37 | 5ʰ 47ᵐ 03.61 | 5ʰ 05ᵐ 39.04 | 5ʰ 16ᵐ 50.45 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

1857 April 12th contin — δ Orionis. c = Rate t₀ =

| | δ Orionis | ε Orionis | Procyon | β Geminorum. |
|---|---|---|---|---|
| Mean | 5ʰ 24ᵐ 21.94 | 5ʰ 28ᵐ 37.54 | 7ʰ 31ᵐ 30.41 | 7ʰ 36ᵐ 11.86 |
| Rate | | | | |
| a | | | | |
| b | | | | |
| c | | | | |

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a -.08 b -.12 c +.13 r +.23 $t_0$ - +10 00



1851 April 12th contin June 5th a = +.11 b = -.01 c = +.09 Rate $t_0$ =

| | α Hydrae | ε Leonis | ϱ Hydrae | β Libræ |
|---|---|---|---|---|
| Mean | 9 20 15.10 | 9 37 22.47 | 9 20 00.27 | 15 08 45.97 |
| Rate | + .01 | .00 | .00 | |
| a | - .06 | - .03 | + .09 | |
| b | - .08 | - .12 | - .01 | |
| c | + .13 | + .14 | + .09 | |
| | .00 | - .01 | - .01 | |
| | 9 20 15.10 | 9 37 22.46 | 9 20 00.26 | |
| | 9 20 16.29 | 9 37 23.75 | 9 20 15.66 | |
| | + 1.29 | + 1.29 | + 15.40 | |
| | + 1.23 | + 1.23 | + 15.15 | |
| | 9 20 16.33 | 9 37 23.69 | 9 20 15.41 | |
| | + .06 | + .06 | + .25 | |

1851 June 10th a = +.09 b = -.02 c = +.11 Rate -.38 $t_0$ = 14 00

July 5th a = +.20 b = +.07 c = +.09 Rate -.33 $t_0$ = 12.00

| | γ Bootis | Arcturus | β Comæ | 12 Comæ Ven |
|---|---|---|---|---|
| Mean | 13 47 17.07 | 14 08 54.16 | 12 24 35.50 | 12 47 04.07 |
| Rate | - .01 | + .01 | + .06 | + 11 |
| a | + .04 | + .04 | + .20 | + .01 |
| b | - .02 | - .02 | + .03 | + .08 |
| c | + .12 | + .12 | + .10 | + .12 |
| | + .13 | + .15 | + .29 | + .32 |
| | 13 47 17.20 | 14 8 32.31 | 12 24 35.89 | 12 47 4.39 |
| | 13 47 36.57 | 14 8 53.17 | 12 26 34.73 | 12 49 3.40 |
| | + 19.37 | 18.86 | + 1 58.84 | + 1 57.01 |
| | + 19.29 | 19.29 | + 1 58.93 | + 1 58.93 |
| | 13 47 32.49 | 14 8 53.60 | 12 26 34.82 | 12 49 3.32 |
| | + .08 | - .43 | - .09 | + .08 |

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