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On the elements of the orbit of 70 p Ophiuchi.

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The double star 70 p Ophiuchi is H II 4. It was discovered by Sir William Herschel in 1779. The components are of $4\frac{1}{2}$ and 6th magnitudes, coloured yellow and purple. In a small (or in a defective) telescope it is not a very easy object to measure when the distance is small or the line joining the stars inclined to the horizontal direction.

I obtained the first set of elements (Elements I) by aid of Sir J. Herschel's first method using the observed distances and angles. This method, though graphical, is very accurate. There may be some uncertainty in drawing a tangent to an ellipse, but that can be avoided by calculating the angle it forms with the major-axis. The drawback to the method lies in the fact that it depends too much on the distances, the values of which are usually much more uncertain than the angles. In previous papers it has been shown that it is

sometimes possible to represent the observed angles by quite different sets of elements, and that the true orbit is settled by reference to the distances, but this does not imply that it is legitimate to attribute as great weight to the observed distances as to the observed angles. Each datum used in the calculation must enter with its proper weight or the result will not be as accurate as possible. This objection applies still more to Sir J. Herschel's second method (and the methods founded thereon), which has never come into general use for this reason.

The following table shows the normal places adopted after comparing the first orbit with the observations, their probable errors and the square-roots of the weights ($\sqrt{p}$) adopted. The approximate unit of the weight was $\pm 0''.02$. The angles are referred to 1900.0.

t	θ_o	ρ_o	n	θ $\sqrt{p}$	n	ρ $\sqrt{p}$	$\theta_o - \theta_2$	$\rho_o - \rho_2$
1780.75	93°48 $\pm 2''.00$	(4".81) —	2	$\frac{1}{8}$ —	—	—	—4°.6	—
1803.33	326.70 ± 2.00	(2.20) —	2	$\frac{1}{4}$ —	—	—	—7.0	—
1823.00	153.25 ± 0.33	(3.65) —	9	1 —	—	—	+1.5	—
1831.00	136.08 ± 0.23	(5.34) —	17	1 —	—	—	+0.6	—
1836.00	129.26 ± 0.09	6.167 $\pm 0''.022$	21	$1\frac{1}{2}$ 15	1	—	—0.2	+0".19
1842.00	123.57 ± 0.15	6.595 ± 0.027	21	1 21	$\frac{2}{3}$	—	—0.1	+0.06
1848.00	118.55 ± 0.05	6.736 ± 0.029	18	2 13	$\frac{2}{3}$	—	0.0	+0.02
1854.00	113.64 ± 0.08	6.439 ± 0.016	29	2 26	1	—	+0.1	—0.15
1860.00	107.76 ± 0.07	6.071 ± 0.019	27	2 22	1	—	0.0	—0.07
1866.00	101.68 ± 0.11	5.319 ± 0.022	28	2 27	1	—	+0.5	—0.08
1872.00	92.35 ± 0.13	4.291 ± 0.019	27	2 26	1	—	+0.6	—0.10
1878.00	76.25 ± 0.11	3.170 ± 0.016	42	$2\frac{1}{2}$ 33	$1\frac{1}{2}$	—	+0.7	—0.01
1884.00	40.71 ± 0.20	2.183 ± 0.009	42	$2\frac{1}{2}$ 34	2	—	+0.2	+0.09
1890.00	341.06 ± 0.12	2.092 ± 0.012	45	$2\frac{1}{2}$ 43	$1\frac{1}{2}$	—	+0.2	+0.05
1896.00	294.46 ± 0.14	2.261 ± 0.011	72	3 72	2	—	—0.8	+0.03
1901.00	239.32 ± 0.23	1.595 ± 0.015	30	$2\frac{1}{2}$ 28	1	—	+0.6	+0.06

The two last columns show how the final orbit (Elements II) represents the normal places. The errors are larger than the probable errors because small systematic errors in the measures are common to many observers. This applies particularly to the distances.

The discussion of the observations shows that the errors in angle are inversely proportional to the distances. Measured in arc the errors in the angles are one half (or

one third) of those in the distances. The probable error of a well observed angle (mean of those measured in one year by one observer) is about 0".04. The same quantity for the distance (without correcting for constant error but excluding widely divergent values) is about 0".09. There has not been any sensible improvement in the observations since W. Struve's time till quite lately (since 1885 or 1890) when very large telescopes were erected in suitable places.

The equations of condition are as follows:

Distances.

$$\begin{aligned}
 & -0.054 \Delta\Omega - 0.106 \Delta\lambda - 0.008 \Delta\gamma + 0.145 \Delta e - 0.113 \Delta T - 0.165 \Delta n + 0.267 \Delta a - 0''.132 = 0 \\
 & -0.003 \quad -0.006 \quad 0.000 \quad +0.131 \quad -0.052 \quad -0.072 \quad +0.288 \quad -0.067 = 0 \\
 & +0.049 \quad +0.093 \quad -0.006 \quad +0.127 \quad +0.005 \quad 0.000 \quad +0.295 \quad -0.054 = 0 \\
 & +0.094 \quad +0.191 \quad -0.027 \quad +0.135 \quad +0.055 \quad +0.055 \quad +0.288 \quad +0.080 = 0 \\
 & +0.137 \quad +0.283 \quad -0.063 \quad +0.151 \quad +0.101 \quad +0.091 \quad +0.267 \quad -0.012 = 0 \\
 & +0.192 \quad +0.369 \quad -0.111 \quad +0.169 \quad +0.145 \quad +0.109 \quad +0.235 \quad 0.000 = 0 \\
 & +0.238 \quad +0.455 \quad -0.176 \quad +0.183 \quad +0.182 \quad +0.111 \quad +0.192 \quad +0.034 = 0 \\
 & +0.314 \quad +0.597 \quad -0.253 \quad +0.169 \quad +0.197 \quad +0.095 \quad +0.140 \quad -0.019 = 0 \\
 & +1.545 \quad +2.101 \quad -0.299 \quad +0.053 \quad +0.116 \quad +0.035 \quad +0.092 \quad -0.073 = 0 \\
 & -0.147 \quad -0.280 \quad -0.117 \quad -0.143 \quad -0.078 \quad -0.013 \quad +0.090 \quad -0.045 = 0 \\
 & +0.020 \quad +0.040 \quad -0.003 \quad -0.132 \quad +0.091 \quad 0.000 \quad +0.095 \quad -0.033 = 0 \\
 & +0.254 \quad +0.475 \quad -0.170 \quad -0.109 \quad +0.062 \quad -0.012 \quad +0.068 \quad -0.071 = 0
 \end{aligned}$$

Angles.

$$\begin{aligned}
 & +0.420 \Delta\Omega + 0.342 \Delta\lambda - 0.279 \Delta\gamma + 0.118 \Delta e + 0.134 \Delta T + 0.353 \Delta n + 0''.281 = 0 \\
 & +0.192 \quad +0.145 \quad -0.119 \quad +0.126 \quad +0.297 \quad +0.678 \quad +0.056 = 0 \\
 & +0.318 \quad +0.255 \quad -0.210 \quad -0.175 \quad +0.178 \quad +0.324 \quad -0.177 = 0 \\
 & +0.466 \quad +0.268 \quad -0.155 \quad -0.118 \quad +0.121 \quad +0.184 \quad -0.048 = 0 \\
 & +0.526 \quad +0.281 \quad -0.087 \quad -0.091 \quad +0.106 \quad +0.158 \quad +0.059 = 0 \\
 & +0.569 \quad +0.295 \quad -0.003 \quad -0.057 \quad +0.101 \quad +0.139 \quad +0.072 = 0 \\
 & +0.583 \quad +0.298 \quad +0.082 \quad -0.009 \quad +0.094 \quad +0.114 \quad +0.066 = 0 \\
 & +0.569 \quad +0.320 \quad +0.159 \quad +0.013 \quad +0.101 \quad +0.104 \quad +0.044 = 0 \\
 & +0.529 \quad +0.328 \quad +0.225 \quad +0.049 \quad +0.110 \quad +0.095 \quad +0.068 = 0 \\
 & +0.464 \quad +0.337 \quad +0.271 \quad +0.093 \quad +0.121 \quad +0.089 \quad -0.015 = 0 \\
 & +0.377 \quad +0.346 \quad +0.281 \quad +0.143 \quad +0.152 \quad +0.090 \quad -0.035 = 0 \\
 & +0.275 \quad +0.360 \quad +0.227 \quad +0.211 \quad +0.203 \quad +0.100 \quad -0.040 = 0 \\
 & +0.184 \quad +0.247 \quad +0.036 \quad +0.279 \quad +0.308 \quad +0.098 \quad +0.001 = 0 \\
 & +0.178 \quad +0.193 \quad -0.145 \quad +0.182 \quad +0.318 \quad +0.049 \quad +0.070 = 0 \\
 & +0.195 \quad +0.104 \quad +0.033 \quad +0.005 \quad +0.295 \quad +0.001 \quad +0.134 = 0 \\
 & +0.133 \quad +0.214 \quad +0.093 \quad -0.190 \quad +0.419 \quad -0.049 \quad +0.079 = 0
 \end{aligned}$$

The unit of $\Delta\Omega$, $\Delta\lambda$, and $\Delta\gamma$ is $+5^\circ$, of Δe $+0.03$, of ΔT $+1$ year, of Δn $+0.1$, and of Δa $+0''.2$. Mr. J. I. Plummer solved these equations by the method of least squares and obtained the following normal equations:

$$\begin{aligned}
 & +17.82 \Delta\Omega + 19.32 \Delta\lambda - 0.001 \Delta\gamma + 1.559 \Delta e + 4.362 \Delta T + 2.129 \Delta n + 0.809 \Delta a + 0.214 = 0 \\
 & +19.32 \quad +23.68 \quad -1.261 \quad +2.016 \quad +4.612 \quad +1.859 \quad +1.240 \quad -0.225 = 0 \\
 & -0.00 \quad -1.26 \quad +2.252 \quad +0.303 \quad +0.520 \quad +0.195 \quad -0.314 \quad +0.169 = 0 \\
 & +1.56 \quad +2.02 \quad +0.303 \quad +1.736 \quad +0.900 \quad +0.490 \quad +0.212 \quad -0.044 = 0 \\
 & +4.36 \quad +4.61 \quad +0.520 \quad +0.900 \quad +4.001 \quad +0.785 \quad +0.203 \quad +0.659 = 0 \\
 & +2.13 \quad +1.86 \quad +0.195 \quad +0.490 \quad +0.785 \quad +0.684 \quad +0.073 \quad +0.017 = 0 \\
 & +0.81 \quad +1.24 \quad -0.314 \quad +0.212 \quad +0.203 \quad +0.073 \quad +0.530 \quad -0.084 = 0
 \end{aligned}$$

My reason for making use of the method of least squares, the accuracy of which is proved only in case of an infinite (or at any rate a very large) number of equations and where the errors are purely accidental, was that the coefficients in the equations of condition do not change sign very often. When applying Herschel's second method the normal equations may be more easily obtained. The test for the applicability of the method of least squares appears to be that the final errors be distributed according to the law of accidental error, and looking at the final errors exhibited in the first table above, that is seen not to be the case neither with regard to quantity nor to sign. Elements II, though as near the truth as anything that could be calculated at present, are therefore not what is technically known as the »most probable result«, — to obtain which the observations would have to be corrected for all

systematic errors. It is therefore useless to determine the probable errors of the new elements.

The solution of the normal equations gave the following results: $\Delta\Omega = -1^\circ 32'$, $\Delta\lambda = +1^\circ 24'$, $\Delta\gamma = +0^\circ 37'$, $\Delta e = -0.0017$, $\Delta n = -0^\circ 0456$ ($n_1 = -4^\circ 0691$), $\Delta T = -0.25$, $\Delta a = +0''.020$.

Elements of γ Ophiuchi, for the equinox 1900.0.

	I	II	
Ω	$123^\circ 54'$	$122^\circ 22'$	
λ	$164 \ 26$	$165 \ 50$	
γ	$58 \ 31$	$59 \ 8$	
e	0.5006	0.4989	Retrograde.
P	$88^{\text{y}}47$	$87^{\text{y}}49$	
T	1896.29	1896.04	
a	$4''.523$	$4''.543$	

In these orbits the anomalies are taken as positive before and negative after the periastron passage. According to Mr. Burnham's system we should write $\lambda_2 = 194^\circ 10'$.

The comparison with the observations is as follows:

Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$	Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$
W. Herschel	1779.76	100.2	5.21	-10.2	-1.62	Galle	1839.52	126.3	6.35	-1.1	+0.44
"	80.56	—	5.08	—	-0.63	Mädler	39.60	126.2	"	—	+0.07
"	81.74	97.2	4.89	+2.0	—	Dawes	39.65	"	6.36	-0.3	+0.19
"	1802.25	343.7	2.01	-7.6	—	Kaiser	40.35	125.5	6.41	+2.5	-0.41
"	04.41	325.4	2.21	-6.4	—	O. Struve	40.43	125.4	6.42	+0.6	+0.04
W. Struve	19.64	166.6	2.54	+1.9	—	Dawes	40.59	125.3	6.43	-0.4	+0.20
"	20.77	160.7	2.85	-0.5	—	Mädler	41.44	124.6	6.49	+0.8	-0.04
Hersch.&South	21.30	158.4	2.99	-2.2	+0.69	Kaiser	41.66	124.4	6.50	-1.0	+0.04
W. Struve	21.74	156.5	3.12	+1.2	+0.67	Dawes	41.68	"	6.51	-1.0	+0.12
Hersch.&South	22.42	154.0	3.30	+0.8	+1.55	Bessel	41.70	124.3	"	-0.1	+0.28
W. Struve	22.64	153.2	3.36	+0.7	+0.40	Schlüter	41.76	"	"	-0.8	+0.36
Hersch.&South	23.35	151.1	3.55	+2.5	—	O. Struve	42.18	123.8	6.54	+1.9	+0.03
South	25.56	145.3	4.10	+2.9	+0.66	Dawes	42.53	123.5	6.56	-0.2	+0.16
W. Struve	25.57	"	"	+2.9	-0.12	Smyth	42.55	"	"	-1.1	+0.08
"	27.02	142.3	4.44	+2.9	-0.06	Mädler	42.56	"	"	+1.0	-0.31
J. Herschel	28.58	139.5	4.77	+1.1	+0.60	Kaiser	42.59	"	"	-0.9	-0.08
W. Struve	28.71	139.3	4.80	+0.9	-0.02	Schlüter	42.60	"	"	0.0	+0.28
"	29.59	137.8	4.98	+0.3	+0.10	Dawes	43.47	122.7	6.60	-0.7	—
J. Herschel	29.60	"	"	+2.8	—	Encke	43.53	"	6.61	-1.6	+0.09
"	30.39	136.7	5.12	+1.5	+0.89	Mädler	43.57	122.6	"	+0.4	-0.18
Bessel	30.50	136.5	5.14	-0.9	+0.33	Encke	44.36	122.0	6.64	-1.3	+0.20
Dawes	30.57	136.4	5.16	+0.9	+0.37	Mädler	44.57	121.8	6.65	+0.2	-0.17
Smyth	30.76	136.1	5.20	+0.3	+0.23	Hind	45.43	121.1	6.68	-0.3	+0.03
W. Struve	30.84	136.0	5.21	-0.3	+0.10	O. Struve	45.48	121.0	"	+0.2	0.00
J. Herschel	31.53	135.1	5.32	+1.4	+0.62	Mädler	45.54	"	"	-0.2	-0.10
Bessel	31.53	"	"	-1.1	+0.36	Jacob	46.01	120.5	6.69	0.0	+0.14
W. Struve	31.68	134.9	5.35	-0.2	+0.06	Hind	46.46	120.1	6.70	0.0	-0.56
Dawes	32.55	133.8	5.50	0.0	+0.22	Mädler	46.58	120.0	"	-0.2	-0.05
J. Herschel	32.57	"	"	+1.7	-0.15	O. Struve	47.25	119.5	6.71	+1.2	-0.05
Bessel	32.69	133.6	5.52	-0.6	+0.27	Smyth	47.48	119.3	6.72	+0.4	+0.08
W. Struve	32.75	133.5	5.53	+0.5	+0.02	Mitchell	47.59	119.2	"	+1.1	—
Dawes	33.43	132.7	5.63	+0.1	+0.51	Mädler	47.62	"	"	-0.8	+0.07
Smyth	33.59	132.5	5.66	0.0	+0.32	Dawes	48.12	118.7	"	+0.1	+0.08
W. Struve	34.47	131.5	5.78	-0.3	+0.07	Mädler	48.50	118.4	"	-0.2	+0.12
Dawes	34.57	131.4	5.79	-0.8	+0.34	Bond	48.52	"	"	-0.5	+0.13
Bessel	34.61	"	5.80	-0.6	+0.33	O. Struve	49.39	117.7	"	+0.8	+0.01
J. Herschel	34.61	"	"	+1.1	—	Main	50.42	116.8	6.70	0.0	+0.18
Smyth	35.58	130.3	5.92	+0.4	+0.12	Jacob	50.57	116.7	"	-0.6	+0.16
W. Struve	35.60	130.2	5.93	+0.6	+0.18	Mädler	50.64	"	"	0.0	+0.24
Mädler	36.42	129.3	6.03	-0.4	+0.35	Fletcher	50.66	116.6	"	+0.4	-0.24
Galle	36.51	129.2	6.04	-0.1	+0.38	Mädler	51.47	116.0	6.68	-0.6	-0.01
Encke	36.52	"	"	-1.5	+0.44	Fletcher	51.58	115.9	"	-0.1	-0.30
Bessel	36.52	"	"	+0.3	+0.30	Miller	51.64	115.8	"	+0.4	-0.17
J. Herschel	36.65	129.1	6.06	+0.1	+0.91	O. Struve	51.67	"	"	-0.3	-0.06
W. Struve	36.66	"	"	+0.4	+0.08	Smyth	52.44	115.2	6.65	-0.3	-0.15
Dawes	37.05	128.7	6.11	-1.0	+0.39	Fletcher	52.63	114.9	6.64	+1.1	-0.28
Encke	37.46	128.3	6.15	0.0	+0.57	O. Struve	52.67	"	"	+0.2	+0.01
J. Herschel	37.48	"	"	+1.4	—	Mädler	52.71	"	"	-0.5	-0.08
Smyth	37.64	128.1	6.17	-0.6	+0.09	Miller	52.71	"	"	+0.3	-0.17
Bessel	37.69	"	"	-0.6	+0.30	Jacob	52.75	114.8	"	-0.8	+0.09
W. Struve	37.72	128.0	6.18	+0.1	-0.03	Powell	53.55	114.2	6.61	-0.6	—
Smyth	38.51	127.2	6.26	-0.7	-0.01	Dembowski	53.55	"	"	+2.3	-0.25
Galle	38.57	"	"	-0.6	+0.38	Dawes	53.60	114.1	"	+0.5	-0.13

Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$
Mädler	1853.77	114.0	6.60	-0.7	-0.04
Jacob	54.24	113.6	6.57	-0.6	-0.06
O. Struve	54.24	"	"	+0.1	-0.05
Dembowski	54.64	113.2	6.55	+0.2	-0.32
Mädler	54.68	"	"	+0.1	-0.24
Dawes	54.73	113.1	6.54	+0.6	-0.20
Powell	54.78	"	"	-0.2	-
Luther	55.03	112.9	6.53	+2.5	+0.33
Secchi	55.45	112.5	6.51	-0.9	-0.26
Mädler	55.65	112.3	6.50	+0.4	-0.17
Dawes	55.69	"	6.49	+1.0	-0.03
Powell	55.75	112.2	"	+0.2	-
O. Struve	56.09	111.9	6.47	0.0	0.00
Jacob	56.37	111.6	6.45	-0.1	-0.05
Winnecke	56.50	111.5	6.44	+1.1	-0.04
Mädler	56.51	"	"	0.0	-0.12
Secchi	56.55	"	"	-0.3	-0.32
Dembowski	56.63	111.4	6.43	+0.4	-0.05
Jacob	57.13	111.0	6.39	-0.4	+0.06
Winnecke	57.41	110.7	6.37	+1.8	-0.18
Secchi	57.51	110.6	6.36	-0.2	-0.16
Dawes	57.58	110.5	6.35	-0.2	+0.17
Dembowski	57.64	110.4	6.34	-0.9	-0.09
Morton	57.67	"	"	-0.2	-0.19
O. Struve	57.69	"	"	-0.2	+0.08
Jacob	58.12	110.0	6.32	-0.3	-0.22
Morton	58.40	109.7	6.30	-1.1	-0.22
Dembowski	58.44	"	6.29	-0.4	-0.25
Mädler	58.64	109.5	6.27	-0.5	-0.32
O. Struve	59.30	108.9	6.21	+0.2	+0.02
Dawes	59.72	108.4	6.16	+0.9	+0.08
Auwers	59.75	"	"	+0.6	+0.28
Powell	59.77	"	"	-0.6	-0.01
Mädler	59.81	108.3	"	-1.3	+0.09
Secchi	60.61	107.6	6.08	-1.3	-0.01
Luther	60.74	107.4	6.07	+1.6	+0.34
Auwers	60.76	"	6.06	-0.7	+0.46
Main	61.46	106.7	5.99	+0.3	-0.10
Mädler	61.67	106.5	5.97	-0.4	-0.05
Auwers	61.74	106.4	5.96	-0.4	+0.25
Powell	61.81	106.3	5.95	-0.9	-0.15
O. Struve	62.40	105.7	5.89	-0.2	-0.01
Winnecke	62.55	105.5	5.86	+0.5	+0.19
Dembowski	62.62	105.4	5.84	+0.1	-0.12
Mädler	62.72	105.3	"	-0.1	-0.15
Secchi	63.51	104.3	5.74	-0.2	-0.46
Dembowski	63.51	"	"	-0.1	-0.14
Romberg	63.55	"	"	+0.2	+0.02
Winnecke	63.55	"	"	+1.8	+0.31
Hall	63.64	104.2	5.72	+1.5	+0.10
Dembowski	64.60	103.1	5.60	+0.5	-0.15
Engelmann	65.30	102.3	5.50	+0.3	-0.23
Secchi	65.51	102.1	5.47	+0.6	-0.04
Dembowski	65.51	"	"	+0.2	-0.12
Talmage	65.55	102.0	"	+1.9	-0.23
Kaiser	65.62	101.9	5.46	-1.3	-0.15

Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$
Dembowski	1866.13	101.2	5.38	+0.4	-0.12
O. Struve	66.36	100.9	5.35	-0.3	-0.02
Talmage	66.49	100.7	5.33	+1.1	-0.07
Searle	66.50	"	"	+1.3	+0.06
Winlock	66.56	100.6	5.32	-0.1	+0.22
Secchi	66.61	"	5.31	+0.5	-0.04
Main	67.41	99.5	5.19	-1.4	+0.14
Knott	67.44	99.4	5.18	+0.4	+0.04
Talmage	67.52	"	"	+1.1	-
Searle	67.53	99.3	5.17	-0.6	+0.19
Dembowski	67.57	99.2	"	+1.2	-0.11
Winlock	67.65	99.1	5.16	+1.2	-0.57
Dembowski	68.47	97.9	5.02	+0.5	-0.17
Knott	68.56	97.7	5.01	+0.8	-0.03
Main	68.58	"	5.00	+2.2	+0.11
Talmage	68.64	97.6	4.99	+3.5	+0.42
O. Struve	68.72	97.5	4.97	+1.1	-0.24
Dunér	68.72	"	"	+0.1	-0.13
Brünnow	68.90	97.2	4.95	+0.8	-0.03
Dembowski	69.61	96.1	4.83	+0.4	-0.13
Talmage	69.61	"	"	+4.1	+0.48
Dunér	69.64	96.0	4.82	+0.9	-0.23
Peirce	69.73	95.9	4.81	+2.2	+0.30
Dembowski	70.51	94.6	4.67	-0.5	-0.11
Gledhill	70.51	"	"	-0.6	-0.22
Talmage	70.52	"	"	-0.2	-0.05
Main	70.58	94.5	4.66	+1.2	+0.12
"	71.49	92.9	4.50	+1.9	-0.08
W. & S.	71.49	"	"	-0.3	+0.10
Peirce	71.51	92.8	4.49	-2.0	+0.12
Dembowski	71.53	92.7	"	-0.1	-0.22
Talmage	71.55	"	4.48	+4.0	-0.12
Knott	71.59	92.6	4.47	+2.3	-0.17
Gledhill	71.64	92.5	4.46	+0.2	-0.17
Dunér	71.72	92.4	4.45	+0.2	-0.25
Brünnow	72.47	90.9	4.30	+0.9	-0.11
Dembowski	72.49	"	"	-0.2	-0.26
Ferrari	72.49	"	"	+0.6	0.00
Main	72.49	"	"	-0.1	-0.02
W. & S.	72.51	90.8	4.29	+0.7	-0.10
O. Struve	72.60	90.7	4.28	+2.3	-0.15
Gledhill	73.51	88.8	4.11	+0.7	-0.21
Dembowski	73.51	"	"	0.0	-0.22
Talmage	73.55	88.7	4.10	-4.0	-0.15
W. & S.	73.57	88.6	4.09	+0.1	-0.08
Main	73.63	88.5	4.08	+0.3	+0.14
"	74.48	86.5	3.91	+2.3	+0.10
Dembowski	74.57	86.2	3.89	-0.1	-0.23
Talmage	74.58	"	"	+2.4	-0.22
O. Struve	74.69	85.9	3.87	+1.2	-0.06
Gledhill	74.73	85.8	3.86	+1.7	+0.06
Dembowski	75.52	83.7	3.70	0.0	-0.22
Schiaparelli	75.62	83.4	3.67	+0.8	-0.23
Seabroke	75.62	"	"	+1.7	-0.18
Main	75.68	83.2	"	+1.6	+0.17
Schur	76.48	80.9	3.51	+1.3	+0.04

Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$	Observer	Epoch	δ_2	ϱ_2	$\delta_0 - \delta_2$	$\varrho_0 - \varrho_2$
Doberck	1876.52	80°7	3°50	-1°8	-0°04	Seagrave	1883.58	44°1	2°15	-4°1	+0°21
Dembowski	76.52	»	»	+0.2	-0.18	Hall	83.60	44.0	»	+3.8	+0.12
Plummer	76.54	»	3.49	-0.5	+0.06	Schiaparelli	83.62	43.9	2.14	-0.2	+0.07
Winnecke	76.57	80.6	3.48	+3.0	+0.15	Jedrzejewicz	83.64	43.7	»	-1.5	+0.08
Schiaparelli	76.59	»	»	+0.7	-0.09	O. Struve	83.65	43.6	»	-1.2	-0.09
Wilson	76.61	80.5	3.47	-0.1	-0.10	Küstner	83.68	43.4	»	+1.8	+0.37
Hall	76.64	»	»	+0.4	+0.09	Seabroke	83.70	43.1	»	+0.9	+0.16
Jedrzejewicz	76.64	»	»	+1.1	-0.20	Engelmann	83.72	43.0	2.13	+0.6	+0.08
Waldo	76.66	80.4	»	-0.7	+0.25	Glasenapp	84.41	37.0	2.05	+3.8	+1.03
O. Struve	76.74	80.1	3.45	+0.9	-0.17	H. C. Wilson	84.41	»	»	+0.4	+0.25
Dembowski	77.51	77.6	3.29	0.0	-0.21	Pritchett	84.52	36.0	2.04	-0.1	+0.14
Flammarion	77.51	»	»	+0.5	-0.07	Perrotin	84.56	35.6	»	-1.1	+0.05
Doberck	77.52	77.5	»	+0.1	+0.18	Hall	84.59	35.4	2.03	+2.2	+0.13
Hall	77.55	77.4	3.28	-1.6	+0.08	Schiaparelli	84.62	35.1	»	+0.2	+0.04
Jedrzejewicz	77.58	77.2	3.27	+2.2	-0.09	Engelmann	84.69	34.5	2.02	+0.8	+0.16
Plummer	77.65	77.1	3.26	+1.4	+0.13	O. Struve	84.69	»	»	-4.3	+0.28
Schiaparelli	77.66	»	»	+0.2	-0.14	Seabroke	84.70	34.4	»	+0.4	+0.53
Winnecke	77.67	77.0	»	+2.8	+0.07	Perrotin	85.50	26.6	1.94	-0.6	+0.14
Stone	77.68	»	»	+1.5	-0.14	W. & S.	85.55	26.1	»	-1.0	+0.03
Schur	77.68	»	»	+2.5	-0.11	Hall	85.57	25.9	»	+3.6	-0.06
O. Struve	77.93	76.1	3.20	+0.2	-0.05	Engelmann	85.64	25.2	»	-0.9	+0.13
Dembowski	78.51	73.8	3.08	+0.7	-0.12	Schiaparelli	85.65	25.1	1.93	+1.4	+0.15
Seabroke	78.54	73.7	»	+1.6	-0.04	Jedrzejewicz	85.71	24.6	»	-1.2	+0.26
Doberck	78.54	»	»	+1.8	-0.05	Tarrant	86.50	16.4	1.90	-1.6	-0.07
Winnecke	78.69	73.1	3.05	+3.2	+0.23	Hall	86.53	16.1	»	-2.3	+0.08
Goldney	78.72	73.0	3.04	-1.1	+0.13	Perrotin	86.56	15.8	»	-0.5	+0.07
Schiaparelli	79.50	69.7	2.87	+0.1	-0.03	Schiaparelli	86.66	14.7	1.89	-0.6	-0.08
Stone	79.53	69.6	»	-0.4	+0.02	W. & S.	86.67	14.6	»	+1.3	+0.12
Hall	79.59	69.1	2.86	+2.2	+0.07	Jedrzejewicz	86.67	»	»	-0.9	+0.12
Seabroke	79.65	68.8	2.84	+1.5	+0.20	Engelmann	86.67	»	»	+0.3	-0.01
Jedrzejewicz	79.66	»	»	-0.2	+0.17	Smith	86.69	14.4	»	+1.4	+0.07
Burnham	79.71	68.5	2.83	+2.0	-0.67	»	87.55	5.2	»	-5.6	-
Doberck	80.47	64.8	2.68	+1.0	-0.24	Hall	87.62	4.5	1.90	-0.9	+0.02
Franz	80.49	64.7	»	-2.6	+0.01	Schiaparelli	87.63	4.4	»	0.0	-0.02
Main	80.53	64.5	2.67	+4.2	+0.42	Jedrzejewicz	87.70	3.7	»	-0.2	+0.18
Hall	80.57	64.3	2.66	+1.2	+0.09	Tarrant	87.81	2.5	»	+1.0	+0.01
Frisby	80.62	64.0	2.65	-1.0	-0.19	Comstock	88.41	356.3	1.92	-3.6	+0.16
Schiaparelli	80.66	63.7	»	+1.2	+0.04	Tarrant	88.55	355.0	1.93	-1.9	-0.01
Jedrzejewicz	80.66	»	»	-0.9	+0.10	Maw	88.55	»	»	-0.5	+0.24
Seabroke	80.74	63.3	2.63	-0.6	-0.08	Hall	88.57	354.8	»	-1.4	+0.09
Doberck	81.23	60.6	2.54	+1.1	+0.26	Schiaparelli	88.64	354.1	1.94	+1.0	-0.06
Hall	81.54	58.7	2.48	+1.9	+0.01	Leavenworth	88.65	354.0	»	-1.6	+0.20
Frisby	81.54	»	»	-2.7	-0.06	Copeland	88.66	353.8	»	+0.9	+0.72
Bigourdan	81.72	57.6	2.45	-1.3	0.00	Burnham	89.30	347.5	1.98	+1.2	+0.18
Smith	81.77	57.3	2.44	+2.0	+0.01	Highton	89.48	345.8	1.99	-1.8	-0.39
H. C. Wilson	82.49	52.5	2.32	-0.2	+0.60	Glasenapp	89.50	345.6	2.00	+3.0	+0.69
Doberck	82.52	52.3	2.31	+3.4	-0.02	Comstock	89.51	345.5	»	+0.2	+0.18
Hall	82.57	51.9	2.30	+4.3	+0.01	Tarrant	89.51	»	»	-0.5	+0.09
Schiaparelli	82.61	51.6	2.29	+0.2	+0.05	Hall	89.58	344.8	»	-0.3	+0.10
O. Struve	82.61	»	»	-2.9	-0.23	Maw	89.64	344.3	2.01	+2.1	-0.05
Jedrzejewicz	82.62	51.5	»	-2.7	-0.04	Schiaparelli	89.70	343.7	»	+1.2	-0.02
Frisby	82.62	»	»	-4.0	0.00	O. Struve	89.71	343.6	»	+1.5	+0.01
Seabroke	82.69	51.1	2.28	+0.1	+0.68	Schur	89.77	343.0	2.02	+0.3	-0.18
Engelmann	82.72	50.8	»	+0.8	+0.07	Glasenapp	90.42	337.3	2.08	+1.2	+0.32
Perrotin	83.49	44.9	2.17	+0.7	+0.11	Highton	90.54	336.1	»	+2.6	+0.53
Frisby	83.57	44.2	2.15	-0.6	-0.15	Hall	90.56	335.9	»	-0.1	+0.05

Observer	Epoch	δ_2	ρ_2	$\delta_0 - \delta_2$	$\rho_0 - \rho_2$	Observer	Epoch	δ_2	ρ_2	$\delta_0 - \delta_2$	$\rho_0 - \rho_2$
Maw	1890.61	335.5	2.09	+1.0	-0.08	Coleman	1895.62	298.2	2.26	-1.1	+0.29
Tarrant	90.66	335.0	2.10	-0.9	+0.12	Lewis	95.69	297.7	»	-1.8	+0.39
Schur	90.70	334.7	»	-0.1	-0.08	See	95.70	»	»	-1.7	-0.25
Bigourdan	90.70	»	»	+0.2	+0.12	Moulton	95.72	297.5	»	-1.2	-0.25
Schiaparelli	90.73	334.5	2.11	+1.6	+0.04	Brown	96.51	291.4	2.17	+0.4	+0.13
Highton	91.47	328.5	2.18	+2.7	+0.32	Aitken	96.51	»	»	-0.1	+0.23
Tarrant	91.53	328.1	»	-0.3	+0.08	Soulé	96.59	290.7	2.16	-2.6	+0.26
Maw	91.54	327.8	»	+0.5	-0.07	Wagner	96.59	»	»	-0.8	+0.07
Hall	91.56	327.6	»	-0.1	+0.05	Bowyer	96.59	»	»	-2.6	+0.17
Collins	91.56	»	»	+1.5	+0.26	Dyson	96.61	290.5	»	-1.0	+0.07
Schur	91.58	327.5	»	+1.3	-0.02	Maw	96.61	»	»	-1.5	+0.15
Schiaparelli	91.60	327.4	2.19	+1.1	-0.04	Niblett	96.62	290.4	»	+0.5	+0.02
Knorre	91.64	327.1	»	+0.1	+0.18	Comstock	96.63	»	»	-2.7	+0.06
Bigourdan	91.65	327.0	»	-0.3	+0.02	Lewis	96.65	290.2	»	-0.1	-0.08
»	92.37	321.4	2.24	+0.5	+0.04	Schur	96.66	290.1	2.15	-3.0	-0.03
Collins	92.41	321.2	»	-0.7	+0.12	Morgan	96.67	290.0	»	-2.6	+0.11
Maw	92.49	320.6	2.25	+1.1	+0.01	Leavenworth	96.73	289.5	2.14	-0.9	+0.05
Comstock	92.57	320.0	2.26	+1.3	-0.07	Aitken	96.80	289.0	»	+0.4	-0.09
Bigourdan	92.62	319.6	»	-0.3	-0.01	Gledhill	96.89	288.3	2.12	+1.4	-0.12
Tarrant	92.63	319.5	»	+1.7	+0.10	Aitken	97.46	283.2	2.04	+0.3	+0.02
Schur	92.64	319.4	»	+1.3	-0.02	Scott	97.50	282.9	2.03	+0.6	+0.08
Schiaparelli	92.65	»	»	+0.9	-0.04	Bowyer	97.52	282.7	»	-0.2	-0.02
Glaserapp	92.68	319.2	2.27	-1.7	-0.32	Doolittle	97.54	282.5	»	-5.1	+0.02
Gledhill	92.69	319.1	»	-1.3	+0.03	Glaserapp	97.55	282.4	2.02	-1.4	+0.02
»	93.45	313.6	2.31	-1.8	+0.09	Maw	97.55	»	»	-2.7	-0.22
Maw	93.47	313.5	»	+0.3	-0.09	Gledhill	97.55	»	»	+1.0	-0.02
Collins	93.56	312.8	»	+0.7	0.00	Lewis	97.58	282.2	»	+0.3	-0.13
Tucker	93.58	312.7	»	+0.7	+0.10	Schur	97.58	»	»	+1.5	+0.05
Schur	93.62	312.3	»	+1.1	-0.04	Pritchett	97.58	»	»	-5.6	+0.01
Comstock	93.62	»	»	+0.4	+0.03	Hussey	97.67	281.3	2.01	-0.9	+0.04
Coleman	93.66	312.0	»	-0.9	-0.08	Doberck	97.70	281.0	2.00	+0.1	+0.02
H. C. Wilson	93.69	311.8	»	-2.6	-0.09	Seabroke	97.75	280.5	1.99	+1.7	-0.24
Lewis	93.69	»	»	-2.9	+0.03	Aitken	97.83	279.8	1.98	-3.1	-0.05
Schiaparelli	93.70	»	»	+0.5	-0.10	»	98.44	273.5	1.87	-0.3	+0.02
Cohn	93.82	310.9	2.32	-6.7	+0.02	Solà	98.47	273.2	»	-2.7	+0.36
Ebell	94.50	306.2	»	+3.6	+0.15	Glaserapp	98.51	272.7	1.86	-1.7	+0.26
Glaserapp	94.51	306.1	»	0.0	+0.35	Scott	98.52	272.6	»	-0.4	+0.39
Maw	94.54	305.9	»	+1.5	-0.03	Bowyer	98.53	272.5	»	+0.9	-0.04
Knorre	94.59	305.6	2.31	-1.0	+0.07	Maw	98.55	272.3	»	-1.6	+0.05
Schur	94.60	305.5	»	+0.8	-0.05	Schur	98.56	272.2	1.85	+0.2	+0.07
Coleman	94.60	»	»	-0.9	-0.01	Coleman	98.58	272.0	»	-1.3	+0.36
Highton	94.63	305.2	»	-1.0	+0.33	Bryant	98.62	271.7	1.84	+2.0	-0.09
Comstock	94.75	304.4	»	-1.9	-0.01	Lewis	98.70	270.7	1.83	-1.1	-0.21
Callandreaux	94.77	304.3	»	-3.0	+0.14	Seabroke	98.72	270.4	1.82	+0.8	-0.18
Schiaparelli	94.77	»	»	-1.1	-0.10	Aitken	99.37	262.6	1.71	-0.4	-0.01
Bigourdan	94.79	304.1	»	-1.6	+0.02	Brown	99.42	261.9	1.70	+0.4	+0.09
See	95.32	300.3	2.28	-1.6	-0.06	Doolittle	99.46	261.4	»	-1.6	+0.01
Glaserapp	95.50	299.0	2.27	-0.8	+0.27	Schur	99.57	259.9	1.68	+3.3	+0.09
Schur	95.51	298.9	»	+2.7	+0.04	Maw	99.59	259.7	»	-1.5	-0.04
Schwarzschild	95.51	»	»	-0.1	+0.16	Coleman	99.66	258.7	1.67	+1.5	+0.18
Schiaparelli	95.55	298.6	»	+0.1	-0.13	Seabroke	99.77	257.3	1.66	+2.3	-0.02
Maw	95.57	298.5	»	-1.6	-0.01	Aitken	1900.40	248.2	1.58	-0.1	-0.08
Collins	95.58	298.4	»	-2.6	+0.27	Maw	00.54	246.0	1.56	-1.4	-0.11
Gledhill	95.60	298.3	»	-1.7	-0.07	Doolittle	00.57	245.5	»	-2.2	+0.20
Comstock	95.60	»	»	-1.8	-0.08	Bowyer	00.57	»	»	+1.4	+0.05
Hough	95.62	298.2	2.26	-3.2	-0.02	Doberck	00.59	245.2	»	-1.1	+0.43

Observer	Epoch	δ_2	ϱ_2	$\delta_o - \delta_2$	$\varrho_o - \varrho_2$	Observer	Epoch	δ_2	ϱ_2	$\delta_o - \delta_2$	$\varrho_o - \varrho_2$
Boeger	1900.63	244.6	1.56	+3.2	+0.24	Doberck	1902.78	209.9	1.58	+0.4	+0.05
Solà	00.68	243.9	1.55	-0.1	+0.28	"	03.52	199.2	1.68	+0.8	0.00
Seabroke	00.68	"	"	+2.7	+0.13	Biesbroeck	03.53	199.1	"	+0.6	-0.07
Aitken	01.39	232.4	1.52	+0.9	-0.12	Doolittle	03.54	199.0	"	+0.7	+0.20
Bowyer	01.60	228.9	1.51	-1.4	+0.07	Scott	03.69	197.1	1.71	-3.0	+0.04
Seabroke	01.67	227.7	"	+1.4	+0.05	Biesbroeck	04.38	188.8	1.84	+1.8	-0.11
Aitken	01.74	226.6	"	-3.4	-0.12	Bowyer	04.53	187.2	1.87	+1.7	+0.11
Maw	01.75	226.4	"	+0.1	+0.07	Doberck	04.84	183.9	1.94	-0.5	-
Bowyer	02.55	213.4	1.55	-1.2	+0.11	"	05.65	176.6	2.14	+2.2	-

In the following table the probable errors of the annual means of each observer's measures are given. The constant error in distance signifies: observation minus calculation.

Observer	Angle P. E.			Distance		
	Deg. at 4"	arc.	n	Constant	P. E.	n
W. Herschel	± 5.63	± 0.394	4	-1.125	?	2
Herschel & South	± 1.64	± 0.115	12	+0.721	± 0.266	8
W. Struve	± 0.80	± 0.056	15	+0.112	± 0.125	13
O. Struve	± 0.84	± 0.059	22	-0.032	± 0.064	22
Bessel	± 0.76	± 0.053	7	+0.310	± 0.024	7
Dawes	± 0.72	± 0.050	16	+0.164	± 0.123	15
Smyth	± 0.68	± 0.048	8	+0.095	± 0.086	8
Mädler	± 0.61	± 0.042	20	-0.052	± 0.104	21
Galle	± 1.00	± 0.070	3	+0.400	± 0.028	3
Encke	± 1.71	± 0.120	4	+0.325	± 0.178	4
Jacob	± 0.60	± 0.042	7	+0.017	± 0.100	7
Powell	± 0.72	± 0.050	5	-0.080	?	2
Dembowski	± 0.50	± 0.035	22	-0.172	± 0.049	22
Main	± 1.21	± 0.085	11	+0.107	± 0.083	11
Fletcher	± 0.96	± 0.067	3	-0.273	± 0.024	3
Secchi	± 0.79	± 0.055	7	-0.184	± 0.127	7
Knott	± 1.41	± 0.099	3	-0.053	± 0.080	3
Kaiser	± 2.16	± 0.152	4	-0.150	± 0.127	4
Auwers	± 0.85	± 0.060	3	+0.330	± 0.089	3
Engelmann	± 0.33	± 0.023	6	+0.033	± 0.096	6
Winnecke	± 1.99	± 0.140	7	+0.104	± 0.121	7
Dunér	± 0.49	± 0.035	3	-0.203	± 0.052	3
Gledhill	± 0.72	± 0.050	9	-0.070	± 0.088	9
Talmage	± 2.58	± 0.181	9	+0.008	± 0.204	8
Hall	± 0.93	± 0.065	16	+0.064	± 0.034	16
Wilson & Seabroke	± 0.53	± 0.037	18	+0.054	± 0.148	18
Schiaparelli	± 0.35	± 0.025	19	-0.036	± 0.060	19
Schur	± 0.76	± 0.053	13	-0.018	± 0.051	13
Doberck	± 0.63	± 0.044	12	+0.059	± 0.124	10
Jedrzejewicz	± 0.68	± 0.048	9	+0.064	± 0.106	9
Bigourdan	± 0.40	± 0.028	6	+0.032	± 0.029	6
Perrotin	± 0.34	± 0.024	4	+0.092	± 0.031	4
Glasenapp	± 0.78	± 0.055	8	+0.328	± 0.246	8
Tarrant	± 0.53	± 0.037	7	+0.046	± 0.053	7
H. C. Wilson	± 0.62	± 0.043	3	+0.253	± 0.238	3
Comstock	± 0.82	± 0.057	7	+0.039	± 0.074	7
Highton	± 1.05	± 0.074	4	+0.197	± 0.285	4
Maw	± 0.55	± 0.038	14	-0.013	± 0.074	14
Collins	± 0.73	± 0.051	4	+0.162	± 0.101	4
Coleman	± 0.53	± 0.037	5	+0.148	± 0.146	5

Observer	Angle P. E.			Distance		
	Deg. at 4"	arc	n	Constant	P. E.	n
Lewis	$\pm 0^{\circ}62$	$\pm 0^{\circ}043$	5	0".000	$\pm 0^{\circ}160$	5
Aitken	± 0.37	± 0.026	9	-0.022	± 0.070	9
Bowyer	± 0.55	± 0.039	7	+0.064	± 0.054	7
Doolittle	± 1.10	± 0.077	4	+0.107	± 0.090	4
Scott	± 0.62	± 0.043	3	+0.170	± 0.152	3

The ephemeris, giving the apparent places, has been calculated from the following formulae, which give the mean places:

$$Q \cos \theta = -0^{\circ}9358 + 2^{\circ}8688 \sin(E + 40^{\circ}50')$$

$$Q \sin \theta = +2.0080 + 4.0318 \sin(E - 86^{\circ}40')$$

$$\pm z = -0.4759 - 3.4135 \sin(E - 16^{\circ}14')$$

The two first of these equations were first used by Encke. The third has been added for the use of line of sight spectroscopists. We have thus:

$$\pm \frac{dz}{dt} = \frac{-bn \cos(E + A)}{57^{\circ}3(1 - e \cos E)}$$

$$\text{where } \pm z = a + b \sin(E + A)$$

and $1 - e \cos E$ is the radius vector expressed in parts of the semi-axis major. The three equations are deduced by expressing the coordinates of the companion referred to the axes of the true orbit as functions of the eccentric anomaly, and changing the system of coordinates to the meridian, the parallel and the line of sight.

t	θ_2	Q_2	$\pm z_2$	t	θ_2	Q_2	$\pm z_2$	t	θ_2	Q_2	$\pm z_2$
1906.60	169.5	2.39	+2.934	1913.60	143.7	4.22	+2.575	1920.60	132.6	5.58	+1.680
07.60	163.6	2.66	+2.936	14.60	141.6	4.45	+2.469	21.60	131.4	5.73	+1.530
08.60	158.7	2.94	+2.918	15.60	139.8	4.67	+2.356	22.60	130.3	5.87	+1.378
09.60	154.7	3.21	+2.881	16.60	138.2	4.88	+2.232	23.60	129.2	5.99	+1.220
10.60	151.3	3.48	+2.826	17.60	136.6	5.07	+2.103	24.60	128.2	6.11	+1.061
11.60	148.4	3.74	+2.754	18.60	135.2	5.25	+1.968	25.60	127.2	6.21	+0.899
12.60	145.9	3.99	+2.670	19.60	133.9	5.42	+1.825				

The hypothetical parallax is $0^{\circ}230$, which combined with Krueger's value for the parallax $0^{\circ}162$ gives 2.88 as the mass of the system.

Hongkong Observatory, 1906 April 18.

W. Doberck.

Photographische Aufnahmen von kleinen Planeten.

Objekt	M.Z.Kgst.	α	δ	Gr.	Bb.	Objekt	M.Z.Kgst.	α	δ	Gr.	Bb.
1906 Aug. 8.						1906 Aug. 13.					
1906 UO	9 ^h 40 ^m 8	20 ^h 51 ^m 9	-12° 46'	12.5	W	1906 UP	11 ^h 38 ^m 9	20 ^h 38 ^m 9	-10° 11'	12.8	K
(10) Hygiea	"	20 59.4	-14 16	9.5	"	1906 UO	"	20 47.5	-13 11	12.5	"
						(10) Hygiea	"	20 55.4	-14 28	9.5	"

Neuer Planet UP tägliche Bewegung -0^m8 -3'. - K = A. Kopff, W = M. Wolf.

Astrophys. Institut Königsstuhl Heidelberg, 1906 Aug. 14.

M. Wolf.

Beobachtung des Finlayschen Kometen 1906 d.

1906 Juli 25 12^h 55^m 15^s M. Z. Utrecht $\Delta\alpha = +0^{\circ}18'55''$ $\Delta\delta = -4'55''9$ Vgl. 20.5 α app. = 0^h 43^m 2^s 19 (9.470n)
 δ app. = -9° 0' 34" 7 (0.866) Beob. F. v. d. Bilt

Vergleichstern (1906.0): 0^h 42^m 42^s 27 +1^s 37 -8° 55' 51" 3 +12" 5 AG. Ottak. 156.

In A. N. 4108 Bd. 172 p. 59 Z. 4 v. u. ist die Bemerkung »Komet sehr schwach« zu streichen.

A. A. Nijland.

(325) Heidelberg. Corr. all' effem. (V. R. I. 30): Agosto 14 -15^s -1'8 Gr. 13.2 (non corr. di estinz.) G. Zappa.

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