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1991

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This volume is dedicated to the memory of Dr. G. Teleki

George TELEKI (20.04.1928, Senta – 23. 02. 1987, Beograd)

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Original scientific paper

CATALOGUE OF DECLINATIONS OF 307 BRIGHT STARS IN THE ZONE +65° – +90° (BCAD)

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(Received: March 28, 1990)

SUMMARY: Catalogue of declinations of 307 bright stars in the zone +65° – +90° (BCAD) for the equinoxes B1950.0 and J2000.0 and epoch of observation is presented. The declinations were observed with the Vertical Circle of the Belgrade Observatory by absolute method from 1976 to 1980. All stars were observed at both culminations.

The mean error of a single zenith distance observation is $\epsilon_z^2 = (0''42)^2 + (0''23 \tan z)^2$ and the mean error of the catalogue declinations is $\epsilon_\delta = \pm 0''13$.

The mean epoch of observation is 1978.62.

The mean systematic differences with respect to the fundamental catalogues FK4 and FK5 are: BCAD – FK4 = –0''01 and BCAD – FK5 = +0''05.

The systematic differences $\Delta\delta_\alpha$ and $\Delta\delta_\delta$ with respect to these catalogues are also given. The system of Catalogue BCAD is close to the FK5 system.

1. INTRODUCTION

After a detailed reconstruction of the Belgrade Vertical Circle (BVC) ASKANIA N° 80118 (d=190 mm, f=2578 mm) performed in late 1974 (Usanov et al, 1978) and after satisfactory observational results had been obtained during 1975 (Teleki and Mijatov, 1976), we could start regular observations.

At the 20. Soviet Astrometric Conference held in Leningrad in 1975 after having become acquainted with the state of BVC, following M.S. Zverev's initiative, it was proposed to the fellows of the Belgrade Observatory, participating in the Conference, to work aut, using BVC, a Catalogue of declinations from the programme of bright stars (zone +65° – +90°) by absolute method. The proposal was accepted. It was also recommended to observe all the stars from this catalogue at both culminations since the latitude of the Belgrade Observatory ($\varphi \approx +44° 48'$) makes this possible.

The list of stars recommended for observation was compiled at the Pulkovo Observatory (USSR) and was sent to the Belgrade Observatory in late 1975.

2. OBSERVING PROGRAMME AND ITS REALISATION

The programme of bright stars was composed at the Pulkovo Observatory (Zverev and Timashkova, 1960) on the basis of a accepted at the 14. Soviet Astrometric Conference. At the X IAU General Assembly it was recommended to observe the stars from this programme. The observational list proposed for the Catalogue contained 308 stars of the programme mentioned above. All the stars are contained in the catalogues GC and BD, 198 stars in the BS catalogue, 110 in the FK4 and 237 in the FK5.

The characteristics of the observing programme are the following: The brightest star is of 2.1 magnitude and the faintest one 7.9 magnitude. About 76% of the stars are between 5.0 and 6.9 magnitudes. About 60% of the stars have spectral types A and K. The stars are uniformly distributed in α, but not in δ, because about 60% of them are within the zone +70° – +80° declination.

Since the recommendation to observe all stars at both culminations was accepted on our part, we decided to observe every star at each culmination not less than four times.

The obervations began in April 1976 and were finished in December 1980.

In the course of the observing programme's execution the observations of one star were not successful and for this reason the Catalogue contains 307 stars. Besides, because some observations were rejected (by applying the criterion 2.5σ about 1.5% of the observational material was rejected), for some stars the number of observations appearing in the final declination derivation was less than four per culmination.

The total number of observations taken into account in the compilation of the Catalogue is 3032. The average number of observations per star is 9.9: 4.8 at the upper culmination and 5.1 at the lower one.

The following observers took part in the observations: M. Mijatov, Dj. Božičković, G. Teleki, B. Kubičela and M. Dačić. The observations were mostly carried out by two observers. One set the instrument on a star and read the eyepiese micrometer and the other read the circle and the levels. The two observers mentioned first performed about 56% of the observations working together and 35% was performed by Božičković working alone. Other observers took part in a small number of observations, only in 1976.

3. METHOD OF OBSERVATIONS AND REDUCTIONS

The determination of the zenith distances of stars is performed by using the method applied for vertical circles consisting of observing star meridian transits in two instrument clamps (CE and CW).

The zenith distances are calculated by using the following formula:

$$z=1/2(C_W-C_E)+R/2(m_E-m_W)-1/2\ \Delta i \mp \Delta m+\Delta k+ \Delta r+\Delta\varphi'+\rho-b\sin z \qquad (1)$$

where:

C_E, C_W – circle readings in the positions CE and CW;

m_E, m_W – eyepiece micrometer readings in the positions CE and CW;

R – value of the eyepiece–micrometer–screw revolution in are seconds;

Δi – vertical axis inclination;

Δm – correction for the parallel curvature (sign "–" corresponds to the upper culmination and "+" to lower one);

Δk – total correction to circle reading;

Δr – total correction for run;

$\Delta\varphi'$ – correction for the latitude change due to the polar motion;

ρ – refraction;

b – horizontal flexure component.

The examinations of the microscope micrometer and of the exepiece micrometer (Teleki et al, 1968) have shown that these measuring devices are of good quality.

The corrections for the inclination Δi are determined by measuring with two levels installed of the microscope bearing. Their constants, as well as their quality have been determined earlier (Sadžakov, Mijatov, 1968; Mijatov, Trajkovska, 1984; Bozhichkovich, 1986).

The circle reading corrections Δk are determined by the interpolation from the corrections to the circle divisions obtained by examining the 10' – divisions (Bozhichkovich, Mijatov, 1984).

The run was determined only four times during the observational period and the corrections Δr were applied for the corresponding periods.

The corrections $\Delta\varphi'$ are calculated in accordance with the pole coordinates published by BIH.

The refraction ρ is calculated according to the Pulkovo Refraction Tables (fifth edition). The parameters necessary to the refraction calculation – the outside temperature, the barometric pressure and the water vapour pressure – are determined in the following way. The outside temperature was measured immediately after the observation of every star. The barometric pressure was obtainerd by interpolation from its measurements at the beginning and at the end of the observing night. The water vapour pressure was calculated from the relative humidity. This humidity for every observing night was available from the Aerological Observatory situated near our own.

The flexure determination with the horizontal collimators was made during the entire observational period. The results of these examinations given by Mijatov and Trajkovska (1989) were applied for the determination of b for every observing night.

For stars with declinations higher than 85° the time of the mean setting was registered by a chronometer and taken account of.

The instrument constants a_E, a_W, b'+c (b' – lateral flexure) were within tolerable limits throughout the observational period and required no corrections.

4. SYSTEMATIC DIFFERENCES OF OBSERVED ZENITH DISTANCES

For furter reductions the zenith distances determined observationally are reduced to the equinox

Table 1. Systematic Differences $z_{EW} - z_{WE}$ and $z_{MB} - z_B$.

z	$z_{EW} - z_{WE}$	ϵ	n	$z_{MB} - z_B$	ϵ	n
20°– 25°	+0".13	±0".06	35	+0".03	±0".07	14
25 – 30	+0.08	0.04	102	+0.09	0.07	33
30 – 35	+0.06	0.04	83	+0.11	0.07	31
35 – 40	+0.08	0.04	64	+0.32	0.11	22
40 – 45	+0.31	0.10	23	–	–	–
45 – 50	+0.41	0.08	23	–	–	–
50 – 55	+0.24	0.07	64	+0.22	0.12	26
55 – 60	+0.08	0.06	83	+0.36	0.08	42
60 – 65	+0.02	0.05	102	+0.42	0.09	38
65 – 70	+0.11	0.10	35	+0.36	0.16	18

and epoch B1950.0 using the FK4 proper motions for the stars from this Catalogue and the SAO proper motions for other stars and also to the equinox and epoch J2000.0 using FK5 proper motions for the stars from this Catalogue and the SAO proper motions for the rest of stars.

The examination show that there are systematic differences in the zenith distances associated with the order of observations $z_{EW} - z_{WE}$ and with the observers – between the pair Mijatov–Božičković (MB) on the one hand and Božičković (B) alone on the other $z_{MB} - z_B$. These systematic differences are determined in 5 – zones of zenith distances and are presented in Table 1 where ϵ – is the error of the corresponding difference and n is the number of differences.

The systematic differences are determined only in cases where the minimum number of observations of a star for the derivation of the corresponding quantities (z_{EW}, z_{WE}, z_{MB}, z_B) was two. No weights are applied.

Since $\varphi \approx + 45°$ the observed zenith distances from 20° to 45° belong to the observations at the upper culmination and those from 45° to 70° to the lower culmination.

The systematic differences $z_{EW} - z_{WE}$ are significant only for the zones 40° – 55° and are prominent for the declination zone 85° – 90° (zenith distance zone 40° – 50°). However, since these differences in the case of the same number of observations for the order EW and WE (even number of observations) have no influence and in the case of different number of observations (odd number of observations) only a slight influence on the derived declinations, a special analysis of this effect is not made.

The systematic differences $z_{MB} - z_B$ are not great only for the zones 20° – 35°, but are significant in the rest of them. In determined from a very small number of stars according to the established criterion. For this reason we did not take them into account. The mean systematic differences $z_{MB} - z_B$ from both culminations differ only sisqhtly in all declination zones (range between +0".20 and +0".27). The mean difference for all zones is $z_{MB} - z_B$ = +0".24.

5. ACCURACY OF ZENITH DISTANCE OBSERVATION

The random errors of a single zenith distance observation are determined within the zenith distance zones according to the formula:

$$\epsilon_z = \pm 1.25 \frac{\mathrm{abs}\,(\nu)}{n - m/2} \qquad (2)$$

where:
ν – doviations of individual z values, corrected for the systematic differences from Table 1, from the mean values for every star in a zone;
n – number of deviations;
m – number of stars within a zone.

In Table 2 the values of ϵ_z, n and m for the zenith distance zones of 5° are presented.

The accuracy for ϵ_z is within the accuracy limits obtainable with vertical circles, except at higher zenith

Table 2. Random Error of a Single Observation ϵ_z

z	ϵ_z	n	m
20°– 25°	±0".33	156	35
25 – 30	0.44	492	102
30 – 35	0.42	394	83
35 – 40	0.44	319	64
40 – 45	0.41	98	23
45 – 50	0.46	104	23
50 – 55	0.51	334	64
55 – 60	0.57	420	83
60 – 65	0.57	526	102
65 – 70	0.67	189	35

distances. This is a consequence of poorer atmospheric conditions for observations of northern stars (proximity of the Danube river and immediate vicinity of buildings), so that the star images, especially at higher zenith distances, are indinstinct and unsteady.

The mean random error of a single zenith distance observation can be represented by the fallowing formula:

$$\epsilon_z^2 = (0''.42)^2 + (0.23\tan z)^2 .$$

6. DETERMINATION OF THE CORRECTIONS FOR THE LATITUDE AND FOR THE REFRACTION CONSTANT

The corrections for the latitude, as well as the refraction constant are determined from the well-known equation:

$$2\Delta\varphi + (\tan z_1 + \tan z_2)\,\Delta R = \delta_2 - \delta_1 \tag{3}$$

where:
$\Delta\varphi$ – correction for the preliminary latitude;
ΔR – correction for the refrection constant;
z_1, z_2 – zenith distances of stars at the upper and lower culminations, respectively;
δ_1, δ_2 – mean declination values derived from the observations at the upper and lower culmnations, respectively, with the preliminary latitude $\varphi = +44^\circ\ 48'\ 08''.0$.

The equations of condition of the expression (3) are reduced to equations with the same weights by applying the weights $p = 4\epsilon_0^2/(\epsilon_1^2/n_1 + \epsilon_2^2/n_2)$, where ϵ_1, ϵ_2 are the random errors of a single declination determination at the two culminations, respectively, n_1, n_2 are the numbers of measurements at the two culminations, respectively, and ϵ_0 is the error of the unit weight (assumed $\epsilon_0 = \pm 0''.1$).

From expression (3), after applying the weights p, using the least–square method, we obtain the unknown values $\Delta\varphi$ and ΔR first taking the declinations reduced to the equinox and expoch B1950.0 and then the declinations reduced to the equinox and epoch J2000.0. Although there are some differences in the values of $\Delta\varphi$ and ΔR corresponding to the two equinoxes and epochs, obtained in this way, the declinations obtained by applying $\Delta\varphi$ and ΔR differ negligible. Bearing this in mind we decided to addopt the mean value of these two systems:

$\Delta\varphi = -0''.284 \pm 0''.107$ and $\Delta R = +0''.140 \pm 0''.091$.

The obtained values of $\Delta\varphi$ and ΔR can however, only formally be considered as corrections for the latitude and for the refraction constant since there are other causes affecting the declination determination not taken into account in (3) (Podobed 1968).

With ther addopted correction $\Delta\varphi$ the latitude value becomes: $\varphi = +44^\circ\ 48'\ 07''.716 \pm 0''.107$.

7. DECLINATIONS OF STARS

The declinations of stars are derived from the preliminary corrected declinations iwith latitude φ_0) for the systematic diferences $z_{EW} - z_{WE}$ and $z_{MB} - z_B$ from Table 1 and using $\Delta\varphi$ and ΔR tanz according to the expression:

$$\delta = \delta_1 + \frac{\delta_2 - \delta_1}{1 + q(\epsilon_2/\epsilon_1)^2} \tag{4}$$

where:
δ_1, δ_2 – mean values of the corrected declinations observed at the upper and lower culminations, respectively;
ϵ_1, ϵ_2 – mean errors of a single declination observation at the upper and lower culminations, respectively;

$$q = \frac{(n_1 - 3)(n_2 - 1)}{(n_2 - 3)(n_1 - 1)}$$

n_1, n_2 – number of observations at the upper and lower culminations, respectively. If both n_1 and n_2 are less than four, then q = 1.

Expression (4) with q=1 was applied by Korol' (1969) in the derivation of a unified declination system for bright and faint fundamental stars.

The declinations are derived for the eqinox and epoch B1950.0 and J2000.0. Thereupon by applying the corresponding proper motions from the catalogues FK4, FK5 and SAO, used for reducing zenith distances, they are reduced to the epochs of observation.

The accuracy of the declinations obtained in this way is determined according to the formula:

$$\epsilon_\delta^2 = \left(\frac{a-1}{a}\right)\frac{\epsilon\delta_1^2}{n_1} + \frac{1}{a^2}\frac{\epsilon\delta_2^2}{n_2}$$

where $a = 1 + q(\epsilon_2/\epsilon_1)^2$.

The mean error in declination is $\epsilon_\delta = \pm 0''.13$.
The mean epoch of observation is T = 1978.62.

8. COMPARISON WITH THE FUNDAMENTAL CATALOGUES

The mean systematic differences of the Catalogue with respect to FK4 and FK5 are: BCAD–FK4 = $-0''.01$ and BCAD–FK5 = $+0''.05$. The systematic differences of the Catalogue BCAD of the types $\Delta\delta_\alpha$ and $\Delta\delta_\delta$ with respect to FK4 and FK5 are presented in Tables 3 and 4. The differences $\Delta\delta_\delta$ are obtained by averaging within right ascension zones of 4 hours after eliminating the declination zones of 5°, and the $\Delta\delta_\alpha$ ones by averaging within right ascension zones of 4 hours after eliminating

Table 3. Systematic Differences $\Delta\delta_\alpha$.

α	$\Delta\delta_\alpha$			
	FK4		FK5	
$0^h - 4^h$	−0″.01 ±0.05	(17)	−0″.01 ±0.04	(38)
4 – 8	+0.18 ±0.06	(16)	+0.14 ±0.04	(38)
8 – 12	+0.02 ±0.06	(19)	0.00 ±0.04	(39)
12 – 16	+0.11 ±0.08	(17)	+0.07 ±0.04	(40)
16 – 20	−0.11 ±0.05	(21)	−0.13 ±0.03	(41)
20 – 24	−0.14 ±0.05	(20)	−0.06 ±0.04	(40)

Table 4. Systematic Differences $\Delta\delta_\delta$

δ	$\Delta\delta_\delta$			
	FK4	F	FK5	
65°– 70°	−0″.07 ±0.05	(29)	−0″.01 ±0.05	(36)
70 – 75	−0.10 ±0.04	(27)	0.00 ±0.03	(71)
75 – 80	+0.08 ±0.05	(28)	+0.11 ±0.03	(66)
80 – 85	0.00 ±0.09	(15)	+0.06 ±0.04	(46)
85 – 90	+0.14 ±0.08	(11)	+0.11 ±0.05	(17)

the $\Delta\delta_\delta$ differences. The number of differences is given in the perentheses.

As apparent from Tables 3 and 4 there are significant systematic differences of $\Delta\delta_\alpha$ and $\Delta\delta_\delta$ types in the Catalogue BCAD slightly more pronounced with respect to FK4 indicating that the system of this Catalogue is closer to that of FK5.

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CATALOGUE OF DECLINATIONS OF 307 BRIGHT STARS IN THE ZONE +65° – +90° (BCAD)

The columns contain

1. N – number of the star in the Catalogue BCAD;
2. GC – number of the star in the GC Catalogue;
3. FK5 – number of the star in the FK5 Catalogue;
4. α_{1950} – right ascension of the star for the equinox and epoch B1950.0 rounded to 1;
5. δ_{1950} – declination of the star obtained from observations for the equinox B1950.0 and for the epoch of observation;
6. α_{2000} – right escension of the star for the equinox and epoch J2000.0 rounded to 1;
7. δ_{2000} – declination of the star obtained from observation for the equinox J12000.0 and for the epoch of observation;
8. ϵ – mean random error of obtained declinations;
9. n – number of observations of the star;
10. E – epoch of observation of the star calculated from 1900.0.

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
1	33322	3930	23 59 4	73 20 1.41	0 1 39	73 36 42.74	±0.11	9	78.66
2	303		0 13 22	76 40 23.46	0 16 14	76 57 3.02	.12	9	78.85
3	521	2023	0 23 52	79 46 31.94	0 27 7	80 3 7.35	.14	11	78.14
4	588	2031	0 27 40	76 44 37.16	0 30 55	77 1 10.40	.11	9	78.33
5	648	2034	0 30 19	70 42 22.39	0 33 19	70 58 54.31	.10	10	78.67
6	760	3941	0 35 55	82 13 7.35	0 39 47	82 29 35.13	.12	8	77.80
7	891	24	0 42 18	74 42 54.15	0 45 39	74 59 17.40	.14	10	78.48
8	934		0 44 23	74 34 29.60	0 47 46	74 50 51.10	.10	10	78.88
9	943		0 44 51	72 24 6.84	0 48 9	72 40 27.91	.06	8	78.29
10	1045	3942	0 50 3	83 26 11.60	0 54 53	83 42 27.16	.14	9	78.43
11	1175	2062	0 56 15	80 16 33.56	1 0 30	80 32 42.92	.09	8	78.97
12	1190	2063	0 57 8	70 42 49.71	1 0 31	70 58 58.64	.08	11	78.83
13	1288	906	1 1 31	85 59 24.43	1 8 45	86 15 26.02	.13	9	78.10
14	1420	41	1 7 52	79 24 31.33	1 12 17	79 40 26.57	.13	9	77.87
15	1616	2087	1 17 52	75 58 39.15	1 21 59	76 14 20.46	.13	8	78.97
16	1473		1 10 57	88 45 18.49	1 33 51	89 0 57.07	.17	9	79.53
17	1707	46	1 22 22	67 52 12.50	1 25 56	68 7 47.32	.05	14	78.61
18	1817	1042	1 27 28	70 0 27.53	1 31 14	70 15 53.99	.16	9	78.67
19	1955	51	1 34 29	72 47 10.40	1 38 31	73 2 24.60	.14	10	77.60
20	1987		1 36 10	77 42 57.86	1 40 53	77 58 8.36	.11	8	78.69
21	2045	55	1 38 36	67 47 28.00	1 42 21	68 2 34.86	.20	8	78.87
22	2059		1 39 1	70 22 15.59	1 42 56	70 37 21.55	.10	9	79.52
23	2215		1 47 15	75 20 34.31	1 51 48	75 35 23.85	.12	9	78.88
24	2270		1 50 12	80 39 49.69	1 56 3	80 54 31.92	.11	10	78.61
25	2424		1 57 49	70 39 57.06	2 1 57	70 54 24.92	.06	9	77.11
26	2445	70	1 59 7	72 10 51.67	2 3 26	72 25 16.22	.14	12	79.19
27	2459	2139	2 0 2	77 2 32.17	2 5 7	77 16 53.97	.13	11	79.06
28	2475		2 0 41	75 52 33.79	2 5 31	76 6 54.52	.15	9	78.54
29	2517	3943	2 3 7	81 3 31.90	2 9 25	81 17 45.43	.13	10	79.80
30	2243	907	1 48 49	89 1 43.89	2 31 49	89 15 51.26	.06	8	79.62
31	2618	2149	2 8 42	73 47 38.49	2 13 21	74 1 40.99	.17	9	79.46
32	2661	76	2 10 32	66 17 29.03	2 14 29	66 31 27.77	.22	8	79.18
33	2622	1635	2 8 52	83 19 43.99	2 16 46	83 33 42.34	.11	10	78.19
34	3041	2175	2 29 24	71 4 29.87	2 33 58	71 17 40.18	.03	9	78.97
35	3033	2174	2 29 4	76 29 56.73	2 34 31	76 43 6.70	.14	10	79.72
36	3019	3944	2 28 39	83 36 58.03	2 37 28	83 50 4.32	.09	9	79.92
37	3116	87	2 33 14	72 36 6.20	2 38 2	72 49 5.54	.13	7	79.10
38	3271	92	2 40 30	67 36 49.77	2 44 50	67 49 29.43	.13	10	78.70
39	3270	3945	2 40 26	81 14 20.17	2 47 48	81 26 55.95	.06	10	78.73
40	3527		2 53 21	72 28 21.56	2 58 23	72 40 22.53	.12	11	78.62
41	3638	105	2 59 21	79 13 26.95	3 6 8	79 25 6.76	.08	10	78.01
42	3715	3946	3 3 48	81 16 50.48	3 11 43	81 28 14.31	.12	10	78.49
43	3759	2222	3 6 28	74 12 20.00	3 11 56	74 23 39.22	.12	10	78.59
44	3912	115	3 13 54	77 33 12.91	3 20 20	77 44 6.37	.16	8	79.25
45	4030	1636	3 20 6	84 44 20.04	3 32 20	84 54 43.06	.12	9	77.57
46	4225	2251	3 29 41	73 10 48.26	3 35 12	73 20 49.42	.08	9	79.02

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
47	4423	2262	3 39 15	74 23 6.22	3 45 7	74 32 32.32	± .14	10	78.18
48	4530		3 44 0	70 43 6.76	3 49 14	70 52 17.39	.08	13	79.47
49	4557	138	3 45 3	71 10 50.49	3 50 22	71 19 57.01	.12	11	78.98
50	4691	2277	3 51 4	71 40 33.94	3 56 30	71 49 17.61	.14	10	78.69
51	4781	2285	3 56 3	78 3 48.02	4 3 11	78 12 10.54	.19	10	78.27
52	4693	3947	3 51 17	86 29 17.65	4 10 1	86 37 36.51	.11	9	79.54
53	4882		4 1 14	73 51 58.06	4 7 11	74 0 2.82	.12	12	79.34
54	4894		4 1 34	80 33 56.47	4 10 3	80 41 55.16	.16	10	79.15
55	5180	2312	4 14 43	75 59 11.47	4 21 20	76 6 22.71	.15	12	79.83
56	5208		4 16 24	83 41 33.98	4 28 13	83 48 28.28	.06	8	79.02
57	5265	2321	4 18 14	80 42 34.86	4 27 3	80 49 27.70	.17	11	79.35
58	5279		4 18 49	83 13 37.69	4 30 0	83 20 23.55	.11	9	77.75
59	5401	1122	4 24 35	69 16 8.36	4 29 52	69 22 42.63	.07	9	80.30
60	5301	908	4 19 54	85 25 4.60	4 35 24	85 31 37.42	.13	8	79.69
61	5478	2333	4 27 41	72 25 23.86	4 33 31	72 31 44.74	.02	8	79.41
62	5677	2346	4 36 58	79 33 47.04	4 45 15	79 39 24.97	.18	9	77.58
63	5711		4 39 2	76 31 10.70	4 46 0	76 36 42.84	.15	11	79.06
64	5774	173	4 42 4	75 51 11.52	4 48 50	75 56 31.59	.13	9	77.80
65	5835	2358	4 44 59	70 51 20.09	4 50 36	70 56 30.28	.10	11	79.16
66	5924	178	4 49 4	66 15 39.13	4 54 3	66 20 33.59	.08	8	79.90
67	5962	3948	4 50 54	81 7 0.70	5 0 21	81 11 38.24	.16	10	78.46
68	6288	2387	5 6 3	73 53 8.79	5 12 22	73 56 48.98	.15	10	78.75
69	6405		5 12 2	73 12 51.49	5 18 13	73 16 6.20	.12	9	78.71
70	6471	2396	5 14 46	71 39 49.92	5 20 38	71 42 53.60	.09	10	79.87
71	6455	191	5 14 17	79 10 48.21	5 22 33	79 13 48.88	.12	10	78.93
72	6447	1637	5 13 50	85 53 38.82	5 31 48	85 56 20.74	.17	9	79.37
73	6633		5 21 10	70 11 6.09	5 26 47	70 13 42.69	.15	10	79.42
74	6647	2404	5 21 42	77 56 9.66	5 29 26	77 58 39.34	.08	12	79.32
75	6778		5 26 42	85 38 18.12	5 43 49	85 40 6.04	.18	8	78.00
76	6938	205	5 33 2	75 0 54.80	5 39 44	75 2 37.75	.19	11	78.83
77	7297	2436	5 46 27	71 16 35.46	5 52 17	71 17 21.95	.16	10	78.60
78	7273	1638	5 45 34	85 10 27.52	6 1 20	85 10 56.09	.14	10	78.13
79	7606	2459	5 58 16	75 35 17.76	6 5 9	75 35 10.36	.09	9	77.88
80	7856	233	6 7 49	65 43 52.89	6 12 51	65 43 7.49	.12	11	79.36
81	8020	234	6 13 20	69 20 24.30	6 18 51	69 19 13.80	.16	9	78.42
82	8293		6 22 33	70 33 57.84	6 28 15	70 32 6.88	.08	10	79.02
83	8540	2503	6 31 37	73 44 16.44	6 37 55	73 41 44.87	.11	10	78.62
84	8574	2507	6 32 44	78 2 24.66	6 40 29	77 59 44.87	.14	10	79.43
85	8630	2511	6 34 39	71 47 39.28	6 40 32	71 44 55.78	.17	8	78.51
86	8605	3950	6 33 59	82 9 46.79	6 44 30	82 6 56.17	.05	9	78.78
87	8505	3949	6 30 10	86 44 3.99	6 51 47	86 41 5.66	.11	8	78.34
88	8711	248	6 37 44	79 37 9.03	6 46 14	79 34 6.27	.11	9	79.81
89	8957	259	6 48 19	68 56 59.44	6 53 42	68 53 18.20	.06	9	79.07
90	9073	260	6 52 48	77 2 43.72	7 0 4	76 58 39.40	.13	10	79.08
91	9152		6 55 42	70 52 43.27	7 1 22	70 48 30.09	.16	10	78.82
92	9434	2550	7 6 0	78 50 9.59	7 13 55	78 45 9.07	.12	10	78.24

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
93	9489	2552	7 8 10	71 54 5.52	7 13 58	71 48 59.68	± .08	10	78.50
94	9851	3951	7 20 41	82 30 48.93	7 31 4	82 24 42.06	.16	8	78.50
95	9985	284	7 25 42	68 34 13.95	7 30 53	68 27 57.21	.11	10	79.61
96	9972		7 25 22	78 47 35.36	7 33 5	78 41 15.00	.21	9	79.59
97	9772	909	7 17 50	87 7 33.35	7 40 31	87 1 12.92	.10	8	78.74
98	10433	2604	7 42 11	70 19 49.91	7 47 31	70 12 27.28	.19	11	78.95
99	10657	2612	7 50 38	77 42 34.38	7 57 40	77 34 35.51	.17	8	78.84
100	10745	300	7 54 15	74 3 15.85	8 0 12	73 55 5.34	.12	10	78.91
101	10808	2617	7 57 1	79 37 12.38	8 4 47	79 28 47.95	.20	10	79.44
102	11100	1215	8 7 52	68 37 25.81	8 12 49	68 28 26.08	.06	9	79.13
103	11031	1639	8 5 14	84 12 30.35	8 16 54	84 3 28.02	.12	8	79.04
104	11246	310	8 13 19	75 54 46.31	8 19 32	75 45 24.42	.09	11	79.35
105	11302		8 15 12	72 33 53.99	8 20 40	72 24 26.67	.14	11	79.31
106	11296	3952	8 15 3	82 35 25.15	8 24 33	82 25 51.13	.13	16	79.39
107	11526	2659	8 24 0	78 23 44.19	8 30 52	78 13 43.30	.13	11	78.99
108	11799	322	8 34 12	73 48 22.59	8 39 43	73 37 48.78	.20	9	78.95
109	11900	3953	8 37 32	82 25 12.62	8 46 23	82 14 21.78	.12	9	78.99
110	12105	2692	8 44 14	78 21 3.44	8 50 47	78 9 54.75	.14	10	78.66
111	12309		8 51 58	78 20 18.12	8 58 23	78 8 44.74	.08	10	78.57
112	12447	338	8 58 4	67 49 35.96	9 2 33	67 37 46.37	.08	12	79.16
113	12154	3954	8 45 54	88 46 15.08	9 21 49	88 34 12.94	.13	9	79.13
114	12603	1640	9 5 16	84 23 11.06	9 15 21	84 10 51.53	.09	8	77.91
115	12687	2729	9 9 14	71 51 45.34	9 14 3	71 39 22.15	.17	11	78.79
116	12726		9 10 54	73 9 16.81	9 15 53	72 56 47.98	.12	8	78.97
117	12814		9 14 49	74 13 41.09	9 19 56	74 1 0.94	.16	11	78.15
118	12988	2749	9 22 40	75 18 55.63	9 27 52	75 5 53.20	.14	16	79.39
119	13171	357	9 30 6	70 3 8.79	9 34 29	69 49 47.78	.11	8	78.37
120	13178		9 30 13	72 25 43.74	9 34 54	72 12 22.04	.19	11	79.05
121	13174	910	9 30 7	81 32 59.99	9 37 5	81 19 35.51	.12	10	79.25
122	13358	363	9 38 0	69 27 57.98	9 42 15	69 14 16.80	.13	9	78.60
123	13364	2772	9 38 24	72 28 52.52	9 42 57	72 15 9.95	.16	8	78.90
124	13419	2780	9 41 29	79 22 4.21	9 47 18	79 8 12.77	.18	11	78.50
125	13684	372	9 53 58	73 7 6.33	9 58 23	72 52 47.18	.16	9	78.58
126	13749	2805	9 57 22	75 0 0.15	10 1 59	74 45 33.31	.22	8	78.33
127	13814	3955	10 0 52	84 9 43.92	10 8 34	83 55 5.96	.17	10	77.93
128	14041	2820	10 11 8	79 11 44.88	10 16 17	78 56 48.95	.15	9	78.67
129	14104		10 13 52	71 18 23.71	10 17 51	71 3 23.35	.18	10	79.20
130	14123	1262	10 14 26	65 21 31.35	10 18 2	65 6 30.18	.13	8	77.60
131	14260	387	10 20 33	65 49 12.24	10 24 8	65 33 59.75	.17	10	78.16
132	14305		10 22 42	84 30 27.35	10 29 41	84 15 8.09	.10	9	78.64
133	14367	911	10 25 10	82 48 52.55	10 31 5	82 33 30.11	.14	10	78.16
134	14507	395	10 30 54	75 58 17.48	10 35 6	75 42 46.82	.09	9	79.35
135	14509	2845	10 31 0	80 45 12.36	10 36 2	80 29 40.84	.18	11	79.72
136	14692		10 38 40	80 41 20.63	10 43 30	80 25 37.56	.13	13	79.19
137	14713	403	10 39 31	69 20 17.92	10 43 4	69 4 34.47	.14	10	78.11
138	14903	2864	10 47 28	76 15 36.83	10 51 23	75 59 41.76	.14	8	77.60

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
139	15077	413	10 56 1	78 2 18.60	10 59 57	77 46 13.18	±.09	9	78.45
140	15304	2888	11 5 1	72 13 47.49	11 8 22	71 57 32.31	.20	10	78.22
141	15335		11 6 40	82 0 15.05	11 10 55	81 43 58.14	.09	9	77.79
142	15376	1641	11 8 49	85 54 43.68	11 14 30	85 38 24.21	.07	8	78.82
143	15459	2896	11 12 32	78 34 54.47	11 16 9	78 18 32.53	.07	7	78.95
144	15799	433	11 28 28	69 36 26.17	11 31 24	69 19 52.75	.10	10	77.58
145	15795	3956	11 28 23	81 24 11.09	11 31 50	81 7 37.49	.14	8	78.12
146	15932	2928	11 34 37	77 52 21.06	11 37 42	77 35 44.13	.10	8	78.55
147	16072	440	11 39 42	67 1 18.77	11 42 28	66 44 40.24	.14	8	77.96
148	16414	3957	11 57 44	81 7 54.86	12 0 19	80 51 12.87	.14	8	78.36
149	16424	2962	11 58 19	70 30 57.88	12 0 53	70 14 15.94	.15	9	78.13
150	16496	1642	12 2 10	85 51 53.41	12 4 28	85 35 11.71	.15	10	79.05
151	16514	451	12 2 44	77 11 4.61	12 5 15	76 54 22.81	.12	8	77.59
152	16672	454	12 9 53	77 53 38.94	12 12 12	77 36 58.31	.09	10	78.18
153	16733	2980	12 12 46	70 28 40.95	12 15 9	70 12 0.68	.05	9	77.67
154	16744		12 13 21	72 49 44.72	12 15 41	72 33 4.72	.11	9	77.24
155	16763	3958	12 14 45	87 58 39.17	12 15 20	87 41 59.51	.14	9	79.58
156	16797	2986	12 16 36	75 26 16.86	12 18 50	75 9 37.76	.09	8	77.76
157	16960	2998	12 24 14	72 12 23.67	12 26 24	71 55 47.67	.15	9	77.07
158	17126	472	12 31 22	70 3 49.85	12 33 29	69 47 17.91	.12	9	78.62
159	17148		12 32 38	70 17 49.62	12 34 44	70 1 18.43	.20	9	78.06
160	17347	3017	12 43 10	80 53 40.67	12 44 26	80 37 16.90	.07	8	77.07
161	17440		12 48 39	83 41 23.17	12 49 7	83 25 4.08	.15	11	78.52
162	17443		12 48 46	83 41 5.27	12 49 14	83 24 46.28	.17	11	78.43
163	17554	486	12 53 29	65 42 33.22	12 55 29	65 26 19.36	.13	10	77.91
164	17637	3037	12 57 19	75 44 31.11	12 58 47	75 28 21.15	.15	10	78.29
165	17932	3056	13 11 57	80 44 9.13	13 12 25	80 28 16.55	.09	9	78.18
166	17934	3057	13 12 6	73 3 48.76	13 13 32	72 47 57.14	.09	8	78.64
167	17991	3060	13 14 50	68 40 16.27	13 16 29	68 24 28.32	.15	10	77.34
168	18183	499	13 24 51	72 39 2.68	13 26 8	72 23 29.53	.07	8	77.13
169	18223	3075	13 26 30	78 54 8.31	13 26 57	78 38 37.36	.19	8	78.79
170	18445	505	13 35 59	71 29 46.70	13 37 11	71 14 32.42	.19	10	78.41
171	18583	3090	13 42 25	78 18 54.39	13 42 39	78 3 51.26	.17	11	79.33
172	18611	1643	13 43 41	83 0 12.19	13 42 23	82 45 9.84	.07	8	78.21
173	18752	3105	13 50 9	79 14 33.12	13 50 1	78 59 44.54	.16	11	78.72
174	18744	3103	13 49 45	68 33 44.11	13 50 59	68 18 56.33	.07	10	78.26
175	19097	3125	14 6 32	74 49 49.85	14 6 56	74 35 37.23	.14	9	79.32
176	19142	524	14 9 1	77 46 58.09	14 8 51	77 32 50.59	.14	9	79.02
177	19189	3128	14 11 8	69 39 59.58	14 12 4	69 25 58.30	.10	10	79.00
178	19548	1379	14 27 36	75 55 6.64	14 27 32	75 41 45.31	.12	9	77.98
179	19630		14 31 5	81 1 52.87	14 29 22	80 48 38.58	.11	14	78.65
180	19705	3159	14 34 57	79 52 39.05	14 33 38	79 39 35.75	.08	8	79.62
181	20088		14 53 35	87 25 20.55	14 40 19	87 12 52.64	.12	9	78.14
182	20029	550	14 50 50	74 21 36.25	14 50 42	74 9 19.75	.13	8	77.38
183	20087	1644	14 53 34	82 43 0.59	14 50 20	82 30 47.71	.15	12	79.32
184	20170	554	14 56 47	66 7 53.01	14 57 35	65 55 55.82	.10	9	77.28

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
185	20236	3189	15 0 22	71 57 41.04	15 0 27	71 45 53.63	±.08	9	77.31
186	20532	565	15 14 3	67 31 59.78	15 14 38	67 20 56.91	.19	8	78.11
187	20598		15 17 7	72 0 19.57	15 17 6	71 49 25.89	.18	10	78.60
188	20613	3208	15 17 48	74 13 33.81	15 17 23	74 2 41.56	.13	11	79.55
189	20692	569	15 20 47	72 0 43.42	15 20 44	71 50 1.82	.13	9	77.79
190	20994	3959	15 34 33	84 59 39.18	15 27 10	84 49 32.13	.11	10	77.58
191	20951		15 32 50	80 56 20.65	15 29 54	80 46 15.44	.14	10	78.89
192	20952	3229	15 32 51	77 30 59.92	15 31 25	77 20 57.37	.14	10	78.21
193	21074		15 37 52	71 18 55.75	15 37 46	71 9 13.28	.17	10	79.15
194	21114	3244	15 39 48	80 46 31.77	15 36 48	80 36 50.78	.14	9	78.79
195	21243	590	15 45 48	77 56 56.59	15 44 4	77 47 39.64	.15	9	77.60
196	21295	1645	15 48 28	83 6 2.97	15 43 27	82 56 49.85	.18	10	79.07
197	21676		16 5 8	76 55 42.15	16 3 31	76 47 37.67	.16	9	78.43
198	21669	3272	16 4 59	70 23 43.84	16 4 49	70 15 41.24	.11	12	79.13
199	21851	606	16 12 13	76 0 15.60	16 10 50	75 52 38.89	.13	10	78.46
200	21880		16 13 46	75 20 8.02	16 12 32	75 12 37.63	.20	10	78.96
201	21916	3289	16 15 21	73 31 4.13	16 14 33	73 23 40.87	.19	9	77.61
202	21999	612	16 18 56	75 52 23.94	16 17 30	75 45 13.59	.13	11	79.59
203	22205	3305	16 28 28	79 4 22.43	16 25 43	78 57 47.24	.11	8	78.85
204	22194	619	16 28 4	68 52 35.46	16 27 59	68 46 4.05	.16	10	79.37
205	22301	623	16 32 46	77 32 58.52	16 30 39	77 26 42.00	.14	9	78.80
206	22337		16 34 28	79 53 36.79	16 31 17	79 47 25.12	.11	8	78.83
207	22749	912	16 51 1	82 7 21.26	16 45 58	82 2 13.80	.12	10	79.51
208	22843		16 54 27	75 28 20.17	16 52 55	75 23 34.26	.18	8	77.63
209	22855	3345	16 54 56	70 32 32.74	16 54 28	70 27 51.44	.19	12	79.03
210	22910	3351	16 57 16	73 12 13.75	16 56 17	73 7 40.76	.10	10	77.52
211	23182	639	17 8 38	65 46 34.64	17 8 47	65 42 52.19	.13	20	78.12
212	23397		17 16 59	71 50 41.02	17 16 13	71 47 32.42	.18	9	78.99
213	23472	3380	17 19 33	70 50 13.34	17 18 57	70 47 16.23	.06	8	77.60
214	23599	3384	17 23 23	80 10 58.49	17 19 37	80 8 10.91	.19	10	78.57
215	23821	659	17 32 10	68 10 4.90	17 31 58	68 8 2.90	.06	10	76.64
216	23865	3396	17 34 3	74 15 34.31	17 32 41	74 13 37.95	.16	9	77.87
217	23944	664	17 37 14	68 47 1.92	17 36 57	68 45 21.84	.14	9	78.27
218	23968		17 38 5	72 28 57.94	17 37 9	72 27 20.21	.09	8	79.48
219	24266		17 49 12	86 59 31.99	17 30 48	86 58 4.64	.10	8	79.64
220	24236	913	17 48 18	86 36 36.23	17 32 13	86 35 10.00	.17	8	79.36
221	24089	670	17 42 49	72 10 18.42	17 41 56	72 9 1.29	.03	9	76.55
222	24090		17 42 51	72 10 47.77	17 41 58	72 9 30.82	.15	9	77.06
223	24180		17 46 8	80 18 5.77	17 42 12	80 16 56.58	.18	9	78.28
224	25111	914	18 21 22	89 3 3.41	17 16 57	89 2 15.79	.09	8	79.41
225	24343	675	17 51 41	76 58 22.29	17 49 27	76 57 41.00	.07	11	77.73
226	24459	3429	17 56 3	72 0 37.79	17 55 11	72 0 18.54	.10	10	78.89
227	24667		18 3 48	79 59 51.72	18 0 3	80 0 0.00	.09	16	77.37
228	24669		18 3 54	80 0 3.42	18 0 9	80 0 12.18	.08	16	77.45
229	25114		18 21 29	71 18 43.15	18 20 45	71 20 15.19	.12	10	77.43
230	25122	695	18 21 58	72 42 31.75	18 21 3	72 44 5.46	.10	10	78.91

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
231	25364	3960	18 31 48	86 37 43.90	18 15 29	86 39 27.14	±.11	9	78.33
232	25244	3467	18 27 23	79 11 27.87	18 24 8	79 13 19.97	.16	10	78.93
233	25334	1646	18 30 48	83 8 32.33	18 24 9	83 10 32.14	.10	8	78.11
234	25372	700	18 32 11	77 30 34.17	18 29 45	77 32 49.10	.15	10	77.61
235	25491	701	18 36 4	65 26 40.28	18 36 13	65 29 17.53	.16	9	79.23
236	25803		18 47 2	74 1 44.61	18 45 47	74 5 6.09	.12	9	78.79
237	25839	1494	18 48 0	75 22 36.07	18 46 22	75 26 0.76	.14	10	77.89
238	25868	3501	18 49 12	79 53 6.28	18 45 38	79 56 31.65	.08	11	78.17
239	26024	714	18 55 1	71 13 52.16	18 54 24	71 17 49.10	.14	10	79.29
240	26155	3961	18 59 21	82 18 6.51	18 53 54	82 22 11.57	.06	10	78.01
241	26146	3517	18 59 12	69 27 37.12	18 58 53	69 31 53.19	.09	9	78.08
242	26484	3536	19 11 1	76 28 38.47	19 9 10	76 33 40.00	.06	10	77.79
243	26520	723	19 12 33	67 34 27.91	19 12 33	67 39 39.69	.09	11	79.45
244	26638	729	19 16 32	73 15 51.27	19 15 33	73 21 17.60	.15	11	79.49
245	26773	3962	19 21 39	83 22 9.76	19 15 8	83 27 45.93	.09	8	79.00
246	26857	734	19 24 45	79 30 14.55	19 21 40	79 36 10.30	.10	10	78.01
247	27023	3561	19 31 25	70 52 52.59	19 31 0	70 59 20.40	.17	10	79.54
248	27174	3568	19 36 14	74 15 52.48	19 35 10	74 22 38.55	.13	10	78.23
249	27471		19 48 21	70 8 27.99	19 48 10	70 16 3.71	.14	20	79.60
250	27809	3605	20 1 3	76 20 31.80	19 59 37	76 28 54.00	.13	8	78.26
251	27964	1647	20 6 53	84 31 35.28	19 59 20	84 40 8.00	.17	9	79.37
252	27920	3614	20 5 10	73 45 54.82	20 4 27	73 54 33.69	.14	9	78.83
253	28066	759	20 10 37	77 33 43.17	20 8 53	77 42 40.50	.17	13	79.50
254	28070		20 10 44	68 7 18.61	20 10 57	68 16 19.95	.15	9	79.11
255	28324	3631	20 19 53	68 43 13.70	20 20 6	68 52 47.92	.08	9	77.81
256	28611	3963	20 31 28	81 15 12.22	20 28 15	81 25 21.61	.12	12	79.46
257	28583	1538	20 30 14	72 21 44.42	20 30 1	72 31 54.65	.23	8	78.20
258	28690		20 34 14	83 27 16.50	20 29 3	83 37 32.07	.16	9	78.61
259	28639	770	20 32 11	74 47 0.35	20 31 30	74 57 16.61	.11	10	79.57
260	28803		20 38 2	79 15 15.39	20 36 1	79 25 49.31	.13	13	79.62
261	29019	915	20 46 20	82 20 53.10	20 42 35	82 31 51.84	.15	16	79.23
262	29107		20 49 55	80 21 56.15	20 47 34	80 33 8.94	.09	9	78.52
263	29254	3672	20 55 21	75 43 58.62	20 54 44	75 55 31.45	.11	16	78.91
264	29620		21 9 17	86 49 58.65	20 57 23	87 1 57.40	.09	9	78.41
265	29563	795	21 6 32	77 55 27.92	21 5 29	78 7 34.54	.12	18	79.43
266	29550	3693	21 6 6	71 13 49.38	21 6 23	71 25 56.65	.20	11	78.49
267	29792	3964	21 15 31	81 1 20.18	21 13 22	81 13 51.85	.13	18	79.67
268	29998	3709	21 22 51	76 52 31.08	21 22 21	77 5 24.68	.21	9	78.40
269	30118	809	21 28 1	70 20 28.20	21 28 40	70 33 38.41	.11	16	78.69
270	30415	817	21 41 12	71 4 54.98	21 41 55	71 18 39.33	.11	21	79.78
271	30452		21 42 28	72 5 25.81	21 43 4	72 19 13.19	.12	10	78.93
272	30564	3965	21 47 33	83 48 22.96	21 44 23	84 2 18.49	.20	10	78.58
273	30681		21 52 48	79 18 55.59	21 52 13	79 33 6.27	.13	10	77.69
274	30669	1578	21 52 12	73 27 57.00	21 52 47	73 42 7.67	.14	10	78.67
275	30730	3755	21 55 13	80 4 15.12	21 54 26	80 18 30.93	.09	20	79.81
276	30772	3758	21 57 23	74 45 26.19	21 57 51	74 59 48.33	.12	9	78.30

N	GC	FK5	α_{1950}	δ_{1950}	α_{2000}	δ_{2000}	ε	n	E
			h m s	° ′ ″	h m s	° ′ ″	″		
277	30800		21 58 33	72 56 25.57	21 59 15	73 10 50.64	± .13	9	78.85
278	31037	837	22 8 51	72 5 41.12	22 9 48	72 20 28.26	.11	21	79.62
279	31056		22 9 30	69 53 7.89	22 10 39	70 7 56.58	.12	8	77.85
280	31223	1648	22 17 34	85 51 28.49	22 13 11	86 6 27.63	.13	11	78.62
281	31227	3784	22 17 45	76 14 12.65	22 18 20	76 29 16.70	.13	10	78.60
282	31365	3794	22 24 43	70 30 57.02	22 26 1	70 46 14.45	.06	9	77.53
283	31401		22 26 21	78 31 50.15	22 26 43	78 47 9.68	.12	8	78.59
284	31474	1593	22 29 28	78 34 2.78	22 29 53	78 49 27.68	.15	10	78.60
285	31506	1594	22 31 24	75 58 7.10	22 32 16	76 13 35.57	.16	12	79.61
286	31567	851	22 34 32	73 23 1.20	22 35 46	73 38 34.97	.17	8	78.00
287	31604		22 36 9	75 6 42.08	22 37 13	75 22 18.49	.08	8	78.33
288	31671	3966	22 39 20	81 7 50.88	22 39 25	81 23 31.43	.24	9	78.19
289	31855		22 47 44	82 53 20.42	22 47 29	83 9 12.74	.09	9	77.92
290	31857	863	22 47 54	65 56 10.16	22 49 41	66 12 3.83	.16	11	78.70
291	31999	1649	22 54 53	84 4 44.21	22 54 25	84 20 45.37	.17	12	78.20
292	32025	3837	22 56 14	72 51 57.05	22 57 48	73 8 1.41	.17	11	78.41
293	32070	3841	22 58 18	80 4 31.47	22 59 9	80 20 37.55	.17	8	78.32
294	32237		23 6 18	75 7 0.80	23 7 54	75 23 15.98	.20	8	77.83
295	32366		23 12 50	73 57 31.10	23 14 37	74 13 52.47	.10	9	78.89
296	32388	3862	23 13 41	70 36 55.07	23 15 38	70 53 17.07	.10	9	79.05
297	32436	3865	23 15 33	75 1 33.07	23 17 19	75 17 56.58	.18	9	78.07
298	32639		23 25 9	70 5 4.76	23 27 17	70 21 35.68	.14	9	77.47
299	32680	3967	23 27 34	87 1 55.16	23 27 1	87 18 26.73	.09	8	78.26
300	32733		23 29 44	77 32 37.40	23 31 40	77 49 10.91	.10	10	78.70
301	32793	3893	23 32 48	71 21 56.30	23 34 59	71 38 31.49	.20	10	79.01
302	32872	3898	23 37 9	73 43 32.01	23 39 21	74 0 9.10	.13	9	77.68
303	32875	893	23 37 17	77 21 16.61	23 39 21	77 37 53.89	.17	9	78.80
304	33031	895	23 45 30	67 31 44.66	23 47 55	67 48 24.64	.13	9	77.44
305	33113	3919	23 49 32	77 19 19.08	23 51 58	77 35 59.91	.05	8	77.53
306	33166	1627	23 52 22	74 7 55.01	23 54 49	74 24 36.27	.11	9	78.25
307	33205	1650	23 54 4	82 54 46.20	23 56 28	83 11 27.75	.12	9	77.69

APPENDIX

The columns contain

1. N – number of the star in the Catalogue BCAD;
2. $\delta_{1950.0}$ – declination of the star obtained from observation for the equinox and epoch B1950.0;
3. Δ_1 – difference of the star declination obtained from observations at the upper culmination for the equinox and epoch B1950.0 and the declination $\delta_{1950.0}$ from Column 2;
4. Δ_2 – difference of the star declination obtained from observations at the lower culmination for the equinax and epoch B1950.0 and the declination $\delta_{1950.0}$ from Column 2;
5. $\delta_{J2000.0}$ – declination of the star obtained from observation for the equinox and epoch J2000.0;
6. Δ_3 – difference of the star declination obtained from observations at the upper culmination for the equinox and epoch J2000.0 and the declination $\delta_{J2000.0}$ from Column 5;
7. Δ_4 – difference of the star declination obtained from observations at the lower culmination for the equinox and epoch J2000.0 and the declination $\delta_{J2000.0}$ from Column 5;
8. ϵ_1 – random error of a single declination observation of the star at the upper culmination;
9. n_1 – number of observations at the upper culmination of the star;
10. E_1 – epoch of observation of the star at the upper culmination calculated from 1900.0;
11. ϵ_2 – random error of a single declination determination of the star at the lower culmination;
12. n_2 – number of observations at the lower culmination of the star;
13. E_2 – epoch of observation of the star at the lower culmination calculated from 1900.0;

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ′ ″	″		° ′ ″	″	″	″			″		
1	73 20 1.16	+0.03	-0.13	73 36 42.84	+0.06	-0.31	±0.24	4	78.76	±0.58	5	78.30
2	76 40 23.31	.00	.06	76 57 3.03	.03	-.16	.27	4	78.68	.65	5	79.50
3	79 46 31.75	.16	-.34	80 3 7.41	.19	-.53	.41	6	78.56	.59	5	77.08
4	76 44 37.72	-.09	.22	77 1 9.84	-.03	.09	.24	4	78.68	.51	5	77.29
5	70 42 22.25	.06	-.36	70 58 54.33	.09	-.53	.20	4	78.78	.67	6	77.99
6	82 13 4.84	.16	-.84	82 29 37.09	.19	-1.09	.28	4	77.95	.63	4	77.03
7	74 42 54.69	-.03	.09	74 59 16.88	.03	-.09	.31	5	78.71	.75	5	77.11
8	74 34 29.66	.06	-.06	74 50 50.97	.16	-.22	.27	4	78.77	.40	6	79.01
9	72 24 5.92	-.03	.55	72 40 28.50	-.02	.14	.14	4	78.26	.63	4	78.87
10	83 26 12.00	.16	-.22	83 42 26.75	.28	-.44	.32	4	78.45	.51	5	78.40
11	80 16 32.81	.03	.00	80 32 43.38	.25	-.03	.51	4	78.23	.20	4	79.08
12	70 42 49.59	-.25	.11	70 58 58.63	-.13	.05	.34	5	78.71	.24	6	78.88
13	85 59 24.63	-.19	.56	86 15 25.75	-.13	.38	.30	4	78.52	.61	5	76.96
14	79 24 31.25	.47	-.31	79 40 26.53	.59	-.41	.38	4	78.76	.37	5	77.32
15	75 58 39.81	-.03	.06	76 14 19.88	.06	-.09	.34	4	79.22	.39	4	78.65
16	88 45 19.22	-.13	.59	89 0 56.34	-.09	.38	.34	4	79.65	.87	5	79.00
17	67 52 11.59	-.02	.06	68 7 47.89	.02	-.08	.11	4	78.49	.33	10	79.08
18	70 0 29.55	.28	-.38	70 15 52.39	.36	-.52	.41	4	78.76	.59	5	78.55
19	72 47 10.64	.36	-.27	73 2 24.31	.50	-.38	.47	5	78.72	.41	5	76.78
20	77 42 58.06	.25	-.47	77 58 8.13	.31	-.69	.29	4	79.00	.39	4	78.12
21	67 47 28.09	.13	-.42	68 2 34.70	.16	-.55	.46	4	79.02	.85	4	78.36
22	70 22 15.77	.00	.02	70 37 21.34	.03	-.11	.23	4	79.28	.48	5	80.19
23	75 20 35.22	.03	-.09	75 35 23.06	.06	-.16	.17	4	78.98	.52	5	78.22
24	80 39 52.06	-.31	.16	80 54 30.03	-.16	.06	.36	4	78.78	.33	6	78.54
25	70 39 56.78	-.88	.09	70 54 25.06	-.64	.08	.46	5	79.15	.12	4	76.88
26	72 10 50.81	.02	-.05	72 25 16.77	.06	-.22	.36	5	79.34	.80	7	78.66
27	77 2 33.66	.03	-.09	77 16 52.75	.09	-.28	.34	5	79.42	.63	6	78.05
28	75 52 34.22	-.38	.19	76 6 54.13	-.19	.13	.58	5	79.37	.34	4	78.12
29	81 3 31.66	-.25	.31	81 17 45.53	-.13	.19	.37	5	79.63	.41	5	80.02
30	89 1 44.13	-.16	.78	89 15 50.94	-.13	.44	.17	4	79.65	.41	4	79.44
31	73 47 39.34	.03	-.09	74 1 40.31	.31	-.41	.44	4	79.54	.94	5	79.22
32	66 17 29.00	-.16	.20	66 31 27.72	-.09	.11	.58	4	79.02	.66	4	79.38
33	83 19 45.13	.19	-.09	83 33 41.38	.34	-.22	.36	4	79.07	.36	6	77.71
34	71 4 31.59	-.75	.06	71 17 38.88	-.50	.02	.54	5	79.52	.12	4	78.93
35	76 29 58.13	-.13	.19	76 43 5.66	.00	.03	.35	4	79.69	.53	6	79.76
36	83 36 57.13	-.03	.00	83 50 4.88	.13	-.13	.23	4	79.77	.28	5	80.06
37	72 36 5.55	-.14	.38	72 49 5.97	-.09	.22	.30	4	79.79	.50	3	77.23
38	67 36 50.55	.11	-.28	67 49 28.77	.16	-.44	.31	4	79.07	.68	6	77.70
39	81 14 22.16	-.09	.00	81 26 54.41	.19	-.03	.31	4	78.83	.13	6	78.72
40	72 28 22.05	-.13	.05	72 40 22.09	.03	-.02	.45	4	78.78	.40	7	78.56
41	79 13 26.59	-.25	.13	79 25 6.97	-.06	.03	.35	6	79.57	.19	4	77.20
42	81 16 50.59	.06	-.06	81 28 14.19	.16	-.28	.28	4	79.07	.47	6	77.56
43	74 12 22.41	.09	-.13	74 23 37.31	.19	-.28	.29	4	79.00	.50	6	77.93
44	77 33 14.53	.31	-.38	77 44 5.16	.47	-.47	.46	4	79.30	.48	4	79.19
45	84 44 23.72	.50	-.22	84 54 40.13	.75	-.31	.55	5	79.14	.29	4	76.93
46	73 10 48.81	-.09	.06	73 20 48.97	.06	-.03	.23	4	79.24	.25	5	78.84

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ′ ″	″	″	° ′ ″	″	″	″			″		
47	74 23 5.16	.00	-.03	74 32 33.09	.09	-.09	±.43	5	79.20	±.45	5	77.03
48	70 43 8.53	-.27	.08	70 52 16.11	-.09	.03	.39	6	79.60	.23	7	79.43
49	71 10 51.58	-.31	.36	71 19 56.17	-.20	.25	.39	6	79.61	.39	5	78.25
50	71 40 33.66	.22	-.77	71 49 17.80	.28	-.92	.39	6	79.35	.54	4	76.46
51	78 3 48.78	.09	-.13	78 12 9.91	.19	-.28	.57	5	79.06	.66	5	77.22
52	86 29 19.91	-.03	.06	86 37 34.66	.06	-.16	.24	4	79.69	.56	5	79.02
53	73 52 0.00	.03	.00	74 0 1.41	.13	-.13	.41	6	79.95	.39	6	78.78
54	80 33 56.47	-.41	.47	80 41 55.13	-.28	.19	.68	6	79.52	.55	4	78.72
55	75 59 12.13	-.06	.13	76 6 22.22	.03	-.03	.45	7	80.11	.63	5	79.06
56	83 41 33.63	.16	-.03	83 48 28.50	.38	-.06	.31	4	79.58	.12	4	78.93
57	80 42 35.47	-.34	.69	80 49 27.22	-.28	.38	.50	5	79.97	.77	6	78.12
58	83 13 34.69	.03	.00	83 20 25.81	.25	-.09	.53	5	79.81	.26	4	76.98
59	69 16 9.28	-.05	.73	69 22 41.98	-.03	.53	.15	4	80.34	.69	5	79.73
60	85 25 3.78	.00	.06	85 31 37.94	.06	-.19	.29	4	79.77	.51	4	79.45
61	72 25 26.17	-.27	.03	72 31 43.06	.09	.00	.67	4	79.18	.25	4	79.44
62	79 33 46.63	.53	-.34	79 39 25.28	.75	-.44	.53	4	78.97	.52	5	76.71
63	76 31 14.44	-.09	.31	76 36 39.97	-.03	.16	.42	6	79.57	.75	5	77.08
64	75 51 15.25	.28	-.06	75 56 28.72	.50	-.16	.65	5	79.13	.28	4	77.44
65	70 51 20.50	.00	.00	70 56 29.95	.11	-.08	.32	4	79.77	.37	7	78.74
66	66 15 38.89	.00	-.13	66 20 33.73	.02	-.28	.16	4	80.02	.69	4	77.68
67	81 6 59.88	.03	-.06	81 11 38.84	.19	-.22	.52	5	79.14	.56	5	77.69
68	73 53 9.66	-.13	.31	73 56 48.28	-.06	.13	.34	5	79.36	.58	5	77.00
69	73 12 52.34	-.09	.19	73 16 5.53	-.03	.03	.31	4	79.16	.59	5	77.66
70	71 39 50.38	-.03	.20	71 42 53.25	.00	-.05	.21	5	80.34	.55	5	76.72
71	79 10 43.56	-.38	.34	79 13 52.31	-.22	.22	.40	5	80.25	.38	5	77.72
72	85 53 41.25	-.06	.06	85 56 19.03	.09	-.09	.58	5	79.86	.43	4	78.96
73	70 11 6.78	-.05	.28	70 13 42.17	-.02	.13	.41	6	79.70	.76	4	77.74
74	77 56 10.00	.03	-.16	77 58 39.06	.09	-.41	.22	6	79.76	.46	6	77.34
75	85 38 18.06	-.47	.38	85 40 6.09	-.28	.22	.54	4	79.18	.49	4	77.03
76	75 0 54.03	.03	-.03	75 2 38.31	.13	-.13	.60	6	79.98	.67	5	77.10
77	71 16 35.31	-.36	.45	71 17 22.05	-.33	.33	.49	6	79.66	.42	4	77.22
78	85 10 27.47	-.28	.16	85 10 56.13	-.09	.06	.61	6	79.83	.32	4	77.28
79	75 35 18.19	-.19	.06	75 35 10.03	-.03	.03	.42	5	79.48	.22	4	77.22
80	65 43 53.81	.02	-.19	65 43 6.80	.03	-.25	.31	6	79.68	.82	5	76.70
81	69 20 27.28	.38	-.63	69 19 11.52	.42	-.70	.48	5	79.28	.50	4	76.98
82	70 33 57.14	-.45	.44	70 32 7.39	-.33	.31	.25	5	80.14	.24	5	77.93
83	73 44 17.16	.09	-.09	73 41 44.41	.13	-.28	.40	5	79.51	.44	5	77.55
84	78 2 24.66	-.16	.22	77 59 44.88	-.06	.06	.39	5	80.54	.50	5	77.59
85	71 47 39.11	-.08	.02	71 44 55.92	.11	-.03	.68	4	79.95	.39	4	78.05
86	82 9 48.38	-.56	.09	82 6 55.06	-.38	.13	.29	5	79.84	.09	4	78.62
87	86 44 7.03	-.41	.09	86 41 3.41	-.22	.03	.50	4	79.18	.26	4	78.12
88	79 37 26.69	.13	-.63	79 33 53.69	.19	-.81	.24	5	80.22	.44	4	77.82
89	68 56 59.28	.00	.03	68 53 18.34	.00	.00	.17	4	79.15	.86	5	77.78
90	77 2 44.13	-.34	.25	76 58 39.13	-.19	.16	.52	6	80.22	.32	4	78.33
91	70 52 43.81	-.34	.34	70 48 29.70	-.20	.28	.54	5	79.85	.54	5	77.78
92	78 50 9.59	-.06	.03	78 45 9.09	.13	-.09	.51	6	79.75	.30	4	77.26

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ′ ″	″	″	° ′ ″	″	″	″			″		
93	71 54 4.91	-.28	.17	71 49 0.14	-.19	.11	±.30	6	80.03	±.18	4	77.54
94	82 30 50.09	-.31	.34	82 24 41.22	-.22	.22	.45	4	79.45	.45	4	77.55
95	68 34 15.08	-.14	.52	68 27 56.44	-.09	.38	.25	4	79.87	.65	6	78.63
96	78 47 38.44	-.19	.22	78 41 12.88	-.06	.06	.54	4	80.87	.74	5	77.99
97	87 7 34.28	-.56	.09	87 1 12.31	-.34	.06	.53	4	79.19	.23	4	78.65
98	70 19 54.06	-.06	.11	70 12 24.30	-.02	.05	.63	6	79.72	.71	5	77.76
99	77 42 34.78	-.03	.09	77 34 35.25	.00	.00	.40	4	79.17	.75	4	77.63
100	74 3 16.94	-.19	.22	73 55 4.59	-.09	.16	.41	5	79.51	.44	5	78.24
101	79 37 13.91	-.03	.00	79 28 46.94	.13	-.13	.67	5	80.06	.65	5	78.86
102	68 37 25.63	-.02	.33	68 28 26.27	-.02	.23	.13	4	79.17	.73	5	78.28
103	84 12 30.97	.03	-.06	84 3 27.63	.06	-.16	.40	4	79.59	.43	4	78.42
104	75 54 45.88	-.09	.22	75 45 24.78	-.03	.16	.27	4	79.85	.53	7	78.42
105	72 33 54.75	-.09	.17	72 24 26.17	-.03	.09	.41	5	79.73	.63	6	78.47
106	82 35 26.00	-.19	.22	82 25 50.59	-.09	.13	.55	9	79.83	.56	7	78.88
107	78 23 45.16	-.06	.47	78 13 42.63	-.06	.34	.21	4	79.17	.79	7	77.67
108	73 48 25.50	-.03	.19	73 37 46.66	-.06	.16	.38	4	79.16	.92	5	78.09
109	82 25 13.16	-.03	.47	82 14 21.44	-.06	.25	.18	4	79.18	.69	5	77.06
110	78 21 4.09	.13	-.22	78 9 54.31	.09	-.28	.50	5	79.18	.63	5	77.85
111	78 20 18.38	.03	-.03	78 8 44.63	.06	-.09	.30	5	79.19	.27	5	78.08
112	67 49 35.48	-.06	.73	67 37 46.78	-.05	.61	.22	7	79.23	.65	5	78.35
113	88 46 14.91	-.38	.22	88 34 13.16	-.16	.09	.41	4	80.01	.36	5	78.67
114	84 23 10.81	-.50	.13	84 10 51.78	-.47	.06	.34	4	79.17	.16	4	77.63
115	71 51 46.78	-.13	.09	71 39 21.16	-.09	.23	.81	5	79.19	.75	6	78.50
116	73 9 18.69	-.09	.41	72 56 46.66	-.06	.22	.27	4	79.28	.54	4	77.73
117	74 13 43.06	-.38	.28	74 0 59.50	-.28	.22	.62	6	78.51	.48	5	77.88
118	75 18 54.78	-.31	.34	75 5 53.88	-.19	.28	.60	7	79.82	.69	9	78.90
119	70 3 6.64	.19	-.36	69 49 49.53	.30	-.39	.24	4	78.72	.34	4	77.65
120	72 25 46.02	-.23	.52	72 12 20.42	-.16	.39	.56	6	79.57	.76	5	77.90
121	81 33 0.50	-.19	.59	81 19 35.22	-.19	.41	.30	5	79.51	.51	5	78.53
122	69 28 0.03	-.02	.06	69 14 15.30	.00	-.03	.42	5	79.06	.65	4	76.93
123	72 28 53.41	-.30	.47	72 15 9.38	-.20	.33	.40	4	79.52	.50	4	77.93
124	79 22 5.09	-.19	.34	79 8 12.19	-.09	.25	.57	6	78.39	.72	5	78.71
125	73 7 7.47	-.22	.63	72 52 46.41	.00	-.03	.39	5	78.65	.54	4	78.36
126	75 0 1.28	-.09	.06	74 45 32.53	-.03	.00	.73	4	78.18	.52	4	78.41
127	84 9 43.78	.19	-.34	83 55 6.16	.19	-.53	.61	6	78.38	.61	4	77.15
128	79 11 44.97	.00	-.09	78 56 48.97	.03	-.22	.24	4	78.70	.83	5	78.42
129	71 18 25.13	.08	-.30	71 3 22.41	.11	-.47	.48	5	79.45	.91	5	78.29
130	65 21 31.67	.00	.00	65 6 30.02	.03	-.11	.29	4	77.46	.58	4	78.18
131	65 49 12.95	-.05	.13	65 33 59.28	-.02	.03	.37	4	78.25	.89	6	77.87
132	84 30 28.50	.19	-.31	84 15 7.38	.28	-.50	.32	5	78.82	.32	4	78.38
133	82 48 51.81	.00	.00	82 33 30.78	.09	-.13	.41	5	78.21	.45	5	78.09
134	75 58 17.66	-.03	.06	75 42 46.78	.06	-.13	.21	4	80.04	.34	5	78.14
135	80 45 12.56	-.31	.44	80 29 40.78	-.22	.28	.54	5	80.33	.68	6	78.92
136	80 41 20.31	-.19	.41	80 25 37.88	-.09	.25	.46	8	79.32	.60	5	78.88
137	69 20 18.38	-.13	.47	69 4 34.20	-.08	.38	.37	5	78.01	.71	5	78.48
138	76 15 37.66	-.06	.06	75 59 41.19	.06	-.06	.39	4	77.49	.41	4	77.71

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ′ ″	″	″	° ′ ″	″	″	″			″		
139	78 2 19.38	.13	-.16	77 46 12.69	.16	-.25	±.25	4	78.46	±.31	5	78.45
140	72 13 47.86	.06	-.09	71 57 32.13	.13	-.20	.59	5	78.43	.72	5	77.90
141	82 0 20.28	-.22	.09	81 43 54.03	-.03	.03	.38	5	77.46	.22	4	77.95
142	85 54 43.63	-1.09	.16	85 38 24.34	-.84	.19	.38	4	79.77	.14	4	78.69
143	78 34 55.00	.06	-.03	78 18 32.25	.25	-.09	.24	4	79.76	.14	3	78.69
144	69 36 26.73	-.20	.63	69 19 52.41	-.14	.47	.22	4	77.28	.53	6	78.56
145	81 24 10.16	-.06	.28	81 7 38.31	.00	.06	.31	4	78.00	.67	4	78.69
146	77 52 20.78	.09	-.41	77 35 44.44	.09	-.56	.24	4	78.76	.49	4	77.66
147	67 1 17.81	-.63	.41	66 44 41.09	-.48	.38	.44	4	77.25	.36	4	78.42
148	81 7 55.91	-.41	.75	80 51 12.16	-.28	.59	.34	4	78.57	.47	4	77.95
149	70 30 57.59	-.22	.25	70 14 16.25	-.13	.16	.40	4	78.31	.53	5	77.92
150	85 51 50.84	-.16	.06	85 35 13.66	.03	.00	.56	4	79.05	.45	6	79.05
151	77 11 7.31	-.09	.31	76 54 20.78	-.03	.13	.27	4	77.28	.52	4	78.77
152	77 53 38.44	.13	.00	77 36 58.81	.38	-.03	.66	5	77.08	.20	5	78.28
153	70 28 41.63	-.22	.67	70 12 0.25	-.16	.53	.14	5	77.32	.20	4	78.71
154	72 49 45.78	-.03	.16	72 33 3.98	.00	-.06	.24	4	77.05	.81	5	78.76
155	87 58 37.63	.34	-.19	87 42 0.66	.53	-.28	.43	4	80.04	.40	5	79.31
156	75 26 16.75	.09	-.34	75 9 37.94	.13	-.53	.20	4	77.53	.41	4	78.76
157	72 12 24.22	.13	-.20	71 55 47.31	.22	-.36	.34	4	76.35	.55	5	78.31
158	70 3 49.61	.28	-.17	69 47 18.19	.39	-.23	.47	5	78.33	.29	4	78.79
159	70 17 49.70	.08	-.20	70 1 18.45	.13	-.38	.47	4	77.87	.93	5	78.55
160	80 53 41.94	-.16	.88	80 37 15.97	-.13	.63	.14	4	76.80	.31	4	78.48
161	83 41 22.69	.19	-.13	83 25 4.53	.38	-.28	.56	6	77.62	.43	5	79.15
162	83 41 4.84	.19	-.19	83 24 46.69	.38	-.28	.63	6	77.62	.55	5	79.15
163	65 42 34.17	-.11	.42	65 26 18.73	-.08	.30	.27	4	77.62	.72	6	79.09
164	75 44 30.94	.13	-.16	75 28 21.38	.22	-.31	.46	5	77.89	.52	5	78.79
165	80 44 8.91	.00	-.03	80 28 16.81	.13	-.19	.26	4	77.54	.34	5	78.95
166	73 3 49.59	.22	-.38	72 47 56.61	.27	-.55	.22	4	78.58	.31	4	78.77
167	68 40 15.94	.02	-.16	68 24 28.67	.03	-.34	.39	6	77.20	.93	4	78.81
168	72 39 3.03	.00	.09	72 23 29.34	.00	-.16	.16	4	77.05	.71	4	78.79
169	78 54 7.56	.06	-.06	78 38 37.97	.19	-.22	.49	4	78.60	.57	4	79.05
170	71 29 46.94	.14	-.16	71 14 32.33	.23	-.27	.59	5	77.94	.62	5	78.93
171	78 18 53.22	-.06	.09	78 3 52.16	.03	-.06	.54	6	79.22	.63	5	79.52
172	83 0 13.53	-.03	.53	82 45 8.94	.00	.28	.12	4	78.16	.62	4	79.43
173	79 14 33.06	-.03	.03	78 59 44.66	.09	-.06	.52	5	78.18	.52	6	79.17
174	68 33 46.09	.00	.06	68 18 54.92	.02	-.11	.17	5	78.14	.54	5	79.49
175	74 49 49.47	-.50	.53	74 35 37.56	-.38	.44	.38	4	78.87	.47	5	79.78
176	77 46 57.22	-.19	.50	77 32 51.28	-.13	.31	.32	4	78.82	.65	5	79.56
177	69 40 1.02	-.22	.45	69 25 57.36	-.14	.31	.24	4	78.64	.47	6	79.74
178	75 55 6.06	.47	-.44	75 41 45.84	.59	-.56	.43	5	77.13	.34	4	78.78
179	81 1 56.59	-.28	.69	80 48 35.84	-.22	.50	.39	10	78.50	.40	4	79.01
180	79 52 36.56	-.28	.16	79 39 37.50	-.09	.06	.26	4	79.43	.20	4	79.74
181	87 25 20.06	.09	-.13	87 12 53.06	.28	-.31	.32	4	77.16	.46	5	79.52
182	74 21 35.97	-.06	.38	74 9 20.03	-.03	.13	.29	4	76.92	.66	4	79.70
183	82 43 7.25	-.31	.19	82 30 43.06	-.13	.06	.68	8	79.02	.37	4	79.51
184	66 7 52.25	.03	-.30	65 55 56.47	.03	-.45	.22	4	77.11	.89	5	79.01

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ′ ″	″	″	° ′ ″	″	″	″			″		
185	71 57 38.44	.00	.11	71 45 55.55	.02	-.13	±.16	4	77.14	±.74	5	79.67
186	67 32 10.78	-.13	.13	67 20 48.41	-.03	.03	.54	4	76.94	.52	4	79.22
187	72 0 19.31	-.14	.23	71 49 26.14	-.06	.09	.50	5	78.00	.63	5	79.55
188	74 13 32.63	-.22	.16	74 2 42.44	.00	-.03	.52	5	79.23	.46	6	79.77
189	72 0 42.89	.13	-.53	71 50 2.28	.17	-.77	.28	4	77.41	.70	5	79.34
190	84 59 40.75	-.13	.34	84 49 31.00	-.03	.13	.24	4	76.96	.56	6	79.48
191	80 56 20.13	-.41	.75	80 46 15.88	-.31	.56	.40	5	78.43	.55	5	79.74
192	77 30 59.66	-.03	.06	77 20 57.59	.03	-.16	.30	4	77.93	.91	6	79.60
193	71 18 55.28	-.69	.78	71 9 13.66	-.56	.66	.53	5	78.61	.56	5	79.75
194	80 46 30.38	-.03	.19	80 36 51.81	.03	-.09	.29	4	78.69	.83	5	79.33
195	77 56 56.69	.06	-.31	77 47 39.63	.13	-.53	.34	4	77.20	.83	5	79.22
196	83 6 2.97	-.53	.38	82 56 49.91	-.34	.25	.55	4	78.23	.61	6	79.64
197	76 55 41.72	-.28	.31	76 47 38.03	-.16	.16	.50	5	77.64	.43	4	79.32
198	70 23 42.88	-.23	.45	70 15 41.97	-.16	.28	.31	6	78.60	.44	6	80.15
199	76 0 15.25	.00	.00	75 52 39.19	.16	-.16	.34	4	77.18	.46	6	79.80
200	75 20 7.06	.13	-.16	75 12 38.34	.22	-.34	.57	5	78.43	.71	5	79.79
201	73 31 3.22	-.06	.28	73 23 41.59	-.03	.09	.42	4	76.99	.94	5	79.73
202	75 52 16.66	-.34	.09	75 45 18.81	-.13	.03	.67	5	78.03	.36	6	79.98
203	79 4 19.19	-.28	.53	78 57 49.53	-.22	.38	.28	3	77.87	.37	5	80.56
204	68 52 34.45	-.17	.20	68 46 4.78	-.09	.11	.41	4	78.67	.58	6	80.15
205	77 32 50.53	.00	.09	77 26 47.72	.03	-.16	.30	4	78.68	.91	5	79.57
206	79 53 39.06	.34	-.19	79 47 23.47	.56	-.25	.38	4	76.95	.27	4	79.79
207	82 7 21.16	-.41	.09	82 2 13.91	-.16	.03	.50	4	78.01	.35	6	79.91
208	75 28 20.59	-.03	.06	75 23 33.97	.03	-.09	.41	4	77.25	.88	4	79.40
209	70 32 34.28	-.36	.58	70 27 50.36	-.25	.44	.62	6	78.65	.79	6	79.64
210	73 12 14.38	-.06	.28	73 7 40.31	.00	.06	.19	4	77.22	.65	6	79.41
211	65 46 34.03	-.06	.17	65 42 52.63	-.03	.06	.35	5	77.36	.76	15	80.21
212	71 50 41.11	-.42	.27	71 47 32.38	-.28	.17	.55	4	77.22	.53	5	80.10
213	70 50 12.84	-.02	.41	70 47 16.59	.00	.25	.11	4	77.55	.78	4	80.17
214	80 10 58.41	-.13	.16	80 8 11.00	-.03	.03	.54	5	77.68	.56	5	79.55
215	68 10 1.06	.00	.19	68 8 5.78	.00	-.03	.14	4	76.52	.99	6	80.02
216	74 15 33.22	-.19	.38	74 13 38.78	-.09	.19	.44	5	77.09	.50	4	79.39
217	68 46 52.50	-.16	1.00	68 45 28.55	-.13	.86	.35	5	77.86	.73	4	80.89
218	72 28 57.30	-.52	.20	72 27 20.69	-.39	.14	.37	4	78.00	.23	4	80.04
219	86 59 31.91	-.41	.22	86 58 4.81	-.22	.13	.35	4	78.97	.27	4	80.03
220	86 36 34.63	-.25	.56	86 35 11.13	-.16	.41	.41	4	78.97	.60	4	80.18
221	72 10 26.03	.00	-.13	72 8 55.59	.00	-.38	.06	4	76.52	.97	5	80.23
222	72 10 55.72	.00	.02	72 9 24.88	.03	-.20	.31	4	76.52	.94	5	80.23
223	80 18 5.63	-.50	.53	80 16 56.69	-.38	.38	.49	4	77.23	.62	5	79.42
224	89 3 3.53	-.41	.38	89 2 15.66	-.16	.28	.22	4	78.91	.21	4	79.88
225	76 58 15.22	-.22	.41	76 57 46.25	-.16	.22	.16	4	76.53	.31	7	79.99
226	72 0 37.70	-.09	.03	72 0 18.61	.09	-.02	.42	4	76.99	.34	6	79.60
227	79 59 48.00	-.09	.31	80 0 2.66	-.06	.13	.19	4	76.53	.56	12	80.21
228	79 59 59.91	-.19	.50	80 0 14.69	-.09	.31	.19	4	76.53	.50	12	80.21
229	71 18 41.97	-.08	.55	71 20 16.05	-.05	.28	.25	4	77.01	.85	6	80.13
230	72 42 41.95	.03	-.06	72 43 58.16	.16	-.14	.35	6	78.27	.37	4	80.17

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E_1	ε_2	n_2	E_2
	° ' "	"	"	° ' "	"	"	"			"		
231	86 37 43.09	-.13	.38	86 39 27.72	-.03	.16	±.28	5	77.91	±.39	4	79.50
232	79 11 25.66	-.34	.47	79 13 21.53	-.22	.34	.46	5	77.91	.54	5	80.32
233	83 8 33.22	-.03	.44	83 10 31.47	-.03	.28	.19	4	78.06	.86	4	79.14
234	77 30 34.16	-.06	.13	77 32 49.09	.03	-.03	.35	4	76.77	.74	6	79.73
235	65 26 37.89	.27	-.14	65 29 19.25	.31	-.17	.51	4	77.51	.45	5	80.11
236	74 1 42.34	.09	-.06	74 5 7.75	.22	-.09	.40	4	77.25	.41	5	79.84
237	75 22 33.88	-.03	.16	75 26 2.34	.00	.00	.31	4	77.30	.76	6	79.86
238	79 53 4.13	-.06	.22	79 56 33.19	.00	-.06	.19	5	77.57	.40	6	80.39
239	71 13 50.84	-.61	.17	71 17 50.03	-.42	.22	.60	6	78.80	.24	4	79.44
240	82 18 5.91	.03	-.13	82 22 12.00	.19	-.22	.16	4	77.30	.34	6	79.75
241	69 27 38.28	-.16	.45	69 31 52.33	-.14	.38	.20	4	77.27	.42	5	80.46
242	76 28 41.94	.06	-.13	76 33 37.41	.09	-.22	.14	4	77.03	.29	6	79.74
243	67 34 25.13	-.42	.63	67 39 41.59	-.36	.53	.26	5	79.00	.35	6	80.11
244	73 15 48.00	-.31	.53	73 21 19.78	-.19	.38	.42	5	79.04	.59	6	80.25
245	83 22 9.50	-.38	.06	83 27 46.09	-.31	.03	.52	4	78.12	.22	4	79.16
246	79 30 15.53	.09	-.41	79 36 9.56	.19	-.63	.22	4	77.51	.56	6	79.80
247	70 52 50.84	-.25	.30	70 59 21.56	-.14	.16	.54	5	78.66	.57	5	80.54
248	74 15 51.91	.16	-.31	74 22 38.94	.25	-.41	.31	4	77.51	.58	6	79.61
249	70 8 26.83	-.42	.44	70 16 4.48	-.34	.34	.60	9	79.03	.64	11	80.20
250	76 20 33.41	-.16	.28	76 28 52.75	-.06	.13	.31	4	77.53	.44	4	79.74
251	84 31 36.53	-.13	.47	84 40 7.09	-.09	.28	.44	5	79.05	.66	4	80.46
252	73 45 54.03	.06	-.03	73 54 34.25	.16	-.03	.67	5	77.30	.39	4	79.59
253	77 33 42.38	-.28	.38	77 42 41.00	-.19	.22	.59	7	79.12	.62	6	79.97
254	68 7 18.67	-.41	.36	68 16 19.86	-.30	.28	.49	5	78.42	.38	4	79.74
255	68 43 12.58	-.05	.16	68 52 48.70	.00	.00	.17	4	77.30	.42	5	79.78
256	81 15 11.69	-.28	.38	81 25 21.94	-.13	.28	.40	7	79.33	.42	5	79.65
257	72 21 44.94	-.38	.64	72 31 54.20	-.30	.55	.55	4	77.15	.71	4	79.97
258	83 27 16.94	.00	.00	83 37 31.72	.09	-.22	.35	4	77.88	.63	5	80.17
259	74 47 0.69	-.44	.13	74 57 16.31	-.28	.06	.54	5	78.65	.27	5	79.80
260	79 15 15.13	-.22	.16	79 25 49.44	-.13	.03	.60	6	79.04	.50	7	79.99
261	82 20 52.31	-.25	.47	82 31 52.34	-.19	.28	.56	9	79.00	.70	7	79.64
262	80 21 57.09	-.13	.19	80 33 8.16	-.03	.03	.25	4	78.15	.41	5	79.21
263	75 43 57.25	-.13	.38	75 55 32.38	-.06	.16	.38	8	78.54	.60	8	79.85
264	86 49 58.16	-.31	.56	87 1 57.72	-.41	.19	.28	4	77.71	.47	5	79.72
265	77 55 26.91	-.09	.28	78 7 35.19	-.03	.13	.42	10	79.38	.73	8	79.59
266	71 13 52.39	-.52	.39	71 25 54.28	-.39	.28	.67	5	77.28	.65	6	79.43
267	81 1 20.09	-.38	.34	81 13 51.84	-.25	.22	.55	8	79.18	.55	10	80.12
268	76 52 30.31	-.03	.03	77 5 25.19	.06	-.06	.51	4	77.66	.66	5	79.20
269	70 20 27.83	-.02	.08	70 33 38.61	.00	-.05	.32	8	78.64	.80	8	78.98
270	71 4 51.83	-.22	.56	71 18 41.38	-.17	.42	.40	10	79.61	.67	11	80.23
271	72 5 26.73	.11	-.06	72 19 12.42	.13	-.03	.58	5	77.87	.48	5	79.66
272	83 48 22.19	-.03	.09	84 2 19.03	.06	-.13	.63	6	78.35	.65	4	79.00
273	79 18 54.94	.06	-.34	79 33 6.69	.16	-.47	.27	4	77.42	.77	6	78.88
274	73 27 56.13	.16	-.06	73 42 8.25	.31	-.09	.47	4	77.18	.44	6	79.40
275	80 4 15.09	-.38	.63	80 18 30.88	-.28	.50	.37	11	79.54	.47	9	80.29
276	74 45 26.28	-.16	.84	74 59 48.19	-.13	.63	.29	5	78.09	.59	4	79.53

N	$\delta_{1950.0}$	Δ_1	Δ_2	$\delta_{J2000.0}$	Δ_3	Δ_4	ε_1	n_1	E$_1$	ε_2	n_2	E$_2$
	° ′ ″	″	″	° ′ ″	″	″	″			″		
277	72 56 30.06	.06	-.25	73 10 47.34	.13	-.38	±.31	4	78.62	±.70	5	79.66
278	72 5 40.81	-.27	.50	72 20 28.39	-.19	.38	.44	10	79.42	.61	11	79.99
279	69 53 6.91	-.06	.28	70 7 57.25	-.03	.16	.26	4	77.70	.54	4	78.52
280	85 51 27.06	-.44	.75	86 6 28.59	-.44	.53	.40	5	77.95	.58	6	79.79
281	76 14 12.22	-.03	.13	76 29 16.94	.00	.03	.37	5	78.08	.56	5	79.84
282	70 30 56.44	-1.06	.06	70 46 14.83	-.84	.06	.62	5	77.77	.13	4	77.51
283	78 31 51.22	-.03	.22	78 47 8.81	.00	.00	.25	4	78.40	.57	4	79.53
284	78 34 3.25	.00	.00	78 49 27.25	.03	-.09	.43	5	78.32	.71	5	79.37
285	75 58 7.22	.09	-.22	76 13 35.41	.22	-.31	.52	6	79.24	.71	6	80.30
286	73 23 0.34	-.56	.41	73 38 35.56	-.47	.28	.54	4	77.98	.44	4	78.02
287	75 6 41.72	-.38	.06	75 22 18.69	-.16	.06	.36	4	77.43	.15	4	78.50
288	81 7 50.59	.13	-.16	81 23 31.56	.25	-.28	.60	4	77.69	.85	5	78.85
289	82 53 18.91	-.66	.44	83 9 13.84	-.47	.34	.27	4	76.74	.28	5	78.75
290	65 56 13.61	-.05	.06	66 12 1.23	.02	-.02	.46	5	77.89	.59	6	79.79
291	84 4 43.28	.06	-.06	84 20 46.00	.06	-.13	.42	4	77.90	.72	8	78.63
292	72 51 57.84	.25	-.22	73 8 0.72	.31	-.31	.53	5	77.52	.57	6	79.27
293	80 4 30.19	-.06	.13	80 20 38.44	.03	-.03	.42	4	77.67	.52	4	79.29
294	75 7 1.44	-.09	.13	75 23 15.38	.00	.00	.53	4	77.69	.62	4	78.01
295	73 57 30.72	.22	-.28	74 13 52.66	.34	-.31	.27	4	78.62	.39	5	79.25
296	70 36 54.78	-.22	.19	70 53 17.19	-.11	.09	.29	4	77.70	.32	5	80.14
297	75 1 32.81	-.13	.25	75 17 56.69	-.06	.09	.42	4	77.69	.75	5	78.85
298	70 5 4.73	.30	-.06	70 21 35.61	.47	-.09	.65	4	77.66	.34	5	77.44
299	87 1 54.59	-.25	.63	87 18 27.09	-.22	.44	.21	5	77.93	.34	3	79.09
300	77 32 36.94	-.13	.47	77 49 11.16	-.06	.25	.25	5	78.46	.50	5	79.69
301	71 21 56.09	-.31	.38	71 38 31.55	-.20	.25	.61	5	78.72	.66	5	79.33
302	73 43 31.63	-.16	.34	74 0 9.31	-.09	.22	.29	4	77.96	.51	5	77.09
303	77 21 12.13	-.16	.13	77 37 57.09	-.03	.03	.49	4	78.22	.54	5	79.29
304	67 31 44.52	.13	-.16	67 48 24.66	.20	-.27	.33	4	77.69	.46	5	77.09
305	77 19 21.44	-.16	.38	77 35 57.88	-.09	.19	.13	4	77.74	.20	4	77.06
306	74 7 55.06	-.06	.25	74 24 36.13	.00	.06	.23	4	78.41	.62	5	77.45
307	82 54 45.72	-.09	.03	83 11 28.03	.19	-.03	.48	4	78.40	.31	5	77.50

КАТАЛОГ ДЕКЛИНАЦИЈА 307 СЈАЈНИХ ЗВЕЗДА (ЗОНА +65° – +90°)

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Оригинални научни рад

Дат је Каталог деклинација 307 сјајних звезда (зона +65° – +90°) за еквинокције 1950.0 и 2000.0 и епохе посматрања. Декинације су одређене на Вертикалном кругу Астрономске опсерваторије у Београду апсолутном методом у току 1976--1980. године. Све звезде су посматарне у обе кулминације.

Средња грешка једног посматрања зенитске даљине је дата изразом $\epsilon_z^2 = (0''.42)^2 + (0''.23 tgz)^2$, а срдња грешка каталошких деклинација је $\epsilon_\delta = +0''.13$.

Средња епоха посматрања је T = 1978.62.

Средње систематске разлике у односу на фундаменталне каталоге FK4 и FK5 су: Каталог -- FK4 = = – 0''.01 и Каталог – FK5 = +0''.05.

Дате су и систематске разлике $\Delta\delta_\alpha$ и $\Delta\delta_\delta$ у односу на ове каталоге. Констатовано је да је систем Каталога ближи систему FK5.

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Original scientific paper

OBSERVATIONS OF THE SUN AND INNER PLANETS WITH THE LARGE MERIDIAN CIRCLE IN BELGRADE*

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SUMMARY: A description is given of the equipment and the procedure of the observations, along with the mean (O–C) values of the right ascensions and declinations, according to the years, and computed corrections of the orbital elements. It is inferred that the quality of the observations is satisfactory.

1. INTRODUCTION

Visual observations of the Sun, Mercury and Venus in right ascension and declination, with the Large Meridian Circle (D=190mm, f=2578mm, R=$2^{s}.700$, r=$20''.306$) have been carried out at the Belgrade Observatory since 1975 (with a break in 1976) and Mars since 1981. The transit times are registered on a Soviet made printing 21–372P type chronograph, driven by its own quartz oscillator adjusted to the mean time measuring.

The observations being performed by day light, a special protection of the instrument against the solar radiation has been secured. An impregnated linen shield, whose width corresponds to that of the pavilion's opening (2.20m), is fixed along the whole arc of the roof slit.

The Sun is observed (1975–1984) through the Sukharev filter, acquired from the Pulkovo Observatory, while Venus is observed through a black filter. The Sukharev filter is actually an aluminized plane–parallel glass, letting in no more than 0.0001 of the light. Placing a plate like this before the object glass means preventing the excessive energy to pass through the object glass. In this way the conditions under which the Sun is observed are approching those prevailing when the Moon or stars are observed. Investigations have shown that trembling of the Sun's limbs is substantially reduced as compared to that found when the observations are made through a diaphragm and a solar eye–piece.

From 1984 we have used a solar glass filter produced by „The Astronomy Shoppe" whose each side was ground and hand polished to a surface accuracy of 1/10the wave.

The ephemeris of the Sun, Mercury, Venus and Mars were calculated in Pulkovo Observatory according to a programme provided by M.Chubej and after 1984 we obtain ephemeris from Institute of Theoretical astronomy, Leningrad.

2. THE OBSERVATIONS

The objects were observed with a hand driven micrometer by the differential method. The choice of reference stars was made according to the same criterion as aplied in the formation of the differential catalogues (Sadžakov, 1972, 1981, 1990). There were no alterations of the observational team, the distribution of ob-

* The paper is dedicated to the memory of Dr. Đorđe Teleki.

servations was on the whole even and personal errors were determined as well. The mean duration of diurnal observations was four hours. During the summer a small number of FK4 stars was observed to a magnitude of 1.2 only, while possibilities were greater during the winter period (3.4 apparent magnitude). Because of this more Kustner's series were observed during the summer period (during the winter period two series corresponding to both positions of the circle were observed).

In observing the declination is derived by 5 settings on the upper and as many on the lower limbs of the celestial bodies concerned. When Mercury and Venus were placed only the illuminated limbs were observed for both coordinates. When the Mercury's image was of poor quality, it was bisected like those of stars. In all cases the transits times were deduced from 10 contacts.

Before starting the observation of the Sun, the determination was accomplished of the collimation, flexure and the temperature read off. Two or three times a month the mercury horizon was also observed.

3. REDUCTION OF OBSERVATIONS

The right ascension and declination are computed according to the formula:

$$\alpha_{app} = T' + R\sec\delta + (u+m) + n\,tg\delta$$

$$R = c + a\cos\varphi + \omega/2$$

$$\delta_{app} = M - M_o \qquad (CE)$$

$$\delta_{app} = M_o - M \qquad (CW)$$

$$M = M' + m\,r + \Delta\lambda + \rho + f\sin z,$$

where:

T' – time of transit over mean wire,
c – collimation,
a – constant of diurnal aberration,
ω – wire width,
M' – circle reading,
m – reading of the eye-piece micrometer,
$\Delta\lambda$ – correction of the graduated circle,
f – flexure.

In the course of the observations lasting, as already mentioned, about four hours, the collimation is measured in the middle of the series and the flexure before and after observing the Sun. In the case only one limb of the disk has been observed a correction for its apparent semi–diameter has been applied in the reduction, while a correction for the distortion of the illumination of the disk in declination has been introduced.

The observed apparent right ascension and declination of the Sun and the two (three) planets were compared whith those given by ephemeris by forming the annual means of the difference (O–C) according to right ascensions and declinations.

The values obtained are given in Table 1.

Table 1

Mean values of (O–C) (observed minus calculated) for each year beginning with 1975 until 1989; ϵ_α and ϵ_δ are the mean square error of obtained values; n_1 and n_2 are the number of observations for the detedmination of right ascen and declination respectively; N_1 and N_2 number of FK4 stars; k_1 and k_2 are reliability coefficients.

Object	year	temp.	$(O-C)_\alpha$	ϵ_α	n_1	N_1	k_1	$(O-C)_\delta$	ϵ_δ	n_2	N_2	k_2
Sun			$-0^s.036$	$\pm0^s.026$	9	97	11	$0''.02$	$\pm0''.09$	12	137	12
Mercury	1975	+19.0	– .078	.000	5	51	10	– .07	.12	5	51	10
Venus			– .028	.038	10	117	11	.05	.09	10	117	11
Sun			– .018	.025	19	252	13	.05	.07	30	409	14
Mercury	1977	+15.5	.053	.036	8	115	14	– .02	.12	8	115	14
Venus			– .025	.029	23	308	13	.00	.05	23	302	13
Sun			.020	.015	36	459	13	.06	.05	50	607	10
Mercury	1978	+20.0	– .053	.044	15	188	13	– .12	.04	15	188	15
Venus			– .009	.013	41	528	13	– .13	.05	41	528	13

Table 1. cont.

Object	year	temp.	$(O-C)_\alpha$	ε_α	n_1	N_1	k_1	$(O-C)_\delta$	ε_δ	n_2	N_2	k_2
Sun			− .019	.010	47	305	7	− .09	.05	62	296	4
Mercury	1979	+21.2	.007	.019	22	221	10	− .04	.09	22	291	10
Venus			.021	.010	63	511	8	.06	.06	63	511	8
Sun			.013	.012	25	156	5	− .10	.07	41	166	4
Mercury	1980	+17.9	.021	.000	5	19	4	− .13	.13	14	48	3
Venus			.008	.015	43	207	5	− .14	.10	60	291	5
Sun			.001	.006	30	154	5	− .23	.05	46	254	5
Mercury	1981	+19.3	.002	.021	5	24	5	.11	.06	5	24	5
Venus			− .002	.008	26	139	5	.04	.10	26	139	5
Mars			− .005	.013	15	150	10	− .04	.13	15	152	10
Sun			− .004	.003	59	495	8	− .02	.04	59	495	8
Mercury	1982	+25.8	− .003	.009	20	149	7	.02	.08	20	149	7
Venus			.004	.007	48	411	9	− .05	.06	48	411	9
Mars			− .002	.007	22	150	7	.10	.09	22	150	7
Sun			$0^s.002$	$\pm 0^s.004$	39	308	8	$-0''.08$	$\pm 0''.04$	39	308	8
Mercury	1983	+19.9	.045	.010	6	38	6	− .04	.22	6	38	6
Venus			− .004	.005	32	239	7	.06	.08	32	239	7
Mars			− .028	.004	5	45	9	− .09	.25	5	45	9
Sun			− .003	.004	42	362	9	− .05	.05	45	362	8
Mercury	1984	+20.0	− .008	.010	12	150	12	− .01	.05	13	150	12
Venus			− .009	.006	38	390	10	.09	.06	40	390	10
Mars			.003	.006	39	512	14	.06	.05	41	512	12
Sun			− .001	.005	47	133	3	.04	.05	48	137	3
Mercury	1985	+20.1	− .003	.018	8	28	4	− .19	.13	8	28	4
Venus			− .003	.005	45	128	3	− .03	.06	46	132	3
Mars			− .004	.025	4	6	2	.04	.21	4	6	2
Sun			.008	.004	44	124	3	.00	.05	43	120	3
Mercury	1986	+19.9	.012	.007	20	54	3	.03	.07	20	54	3
Venus			− .001	.006	34	102	3	.20	.05	33	98	3
Mars			.000	.012	12	47	4	.04	.08	12	47	4

Table 1. cont.

Object	year	temp.	$(O-C)_\alpha$	ε_α	n_1	N_1	k_1	$(O-C)_\delta$	ε_δ	n_2	N_2	k_2
Sun			.001	.006	23	105	5	− .04	.06	23	105	5
Mercury	1987	+17.0	− .031	.002	3	17	6	.17	.20	3	17	6
Venus			.009	.007	20	92	5	− .02	.08	20	92	5
Mars			.039	.006	2	11	6	.02	.50	2	11	6
Sun			.012	.008	20	85	4	.07	.09	20	85	4
Mercury	1988	+22.7	− .021	.025	5	20	4	.00	.28	5	20	4
Venus			.020	.014	18	75	4	.13	.13	19	75	4
Mars			.028	.033	2	11	6	− .35	.01	2	11	6
Sun			.004	.006	25	70	3	− .02	.05	25	70	3
Mercury	1989	+19.6	.004	.010	11	32	3	.29	.15	11	32	3
Venus			.000	.008	19	52	3	− .15	.09	19	52	3
Mars			− .023	.011	8	27	3	− .14	.14	8	27	3
Sun			$0^s.000$	$\pm 0^s.008$	465	3105	7	$-0''.04$	$\pm 0''.05$	543	3551	7
Mercury	1975–	+19.9	− .002	.016	145	1106	8	− .01	.10	155	1205	8
Venus	−1989		.001	.013	460	3299	7	.00	.07	480	3377	7
Mars			− .002	.009	109	959	9	.02	.10	111	961	9

Table 2

The corrections of the orbital elements of the Sun and the errors (σ) of their determination, based on the observation in the period 1975–1989.

	$0^s.001$								$0''.01$							
	ΔA	σ	$\Delta\varepsilon$	σ	$e\Delta\pi$	σ	σ_o	n	$\Delta\delta_o$	σ	$\Delta\varepsilon$	σ	ΔL_o	σ	σ_o	n
1975	32±34		82±216		− 10±26		±88	9	1±11		− 7±16		−42±35		±33	12
1977	98	37	−334	269	−144	53	90	19	− 7	7	15	17	12	24	38	30
1978	−16	19	− 60	132	8	15	92	36	− 6	6	1	8	14	17	34	50
1979	10	11	124	80	− 10	9	69	47	6	5	−13	8	7	17	39	62
1980	−13	11	27	75	− 21	9	55	25	8	8	− 5	12	16	28	48	41
1981	1	7	26	39	3	5	35	30	25	6	11	10	30	17	36	46
1982	5	4	− 11	24	1	3	27	59	1	4	− 2	6	−15	14	30	59
1983	− 7	4	− 48	22	− 8	3	21	39	11	4	11	7	18	12	22	39
1984	0	4	39	31	− 4	4	24	42	8	6	6	8	−11	17	31	45
1985	− 1	6	6	41	− 3	5	35	47	− 4	7	− 5	8	−18	22	33	48
1986	− 8	4	36	24	1	3	28	44	− 2	6	−12	9	18	18	35	43
1987	− 6	10	60	65	2	9	27	23	3	7	6	14	14	24	29	23
1988	− 2	13	44	69	4	8	35	20	−10	15	− 1	27	28	40	41	20
1989	4	7	− 11	47	13	6	30	25	2	7	0	14	5	17	27	25

Tabela 2. cont.

	$0^s.001$								$0''.01$							
	ΔA	σ	$\Delta\varepsilon$	σ	$e\Delta\pi$	σ	σ_o	n	$\Delta\delta_o$	σ	$\Delta\varepsilon$	σ	ΔL	σ	σ_o	n
1975–1989	−2	±3	28	±16	− 3	±2	±51	467	3	±2	−1	±2	7	±5	±35	550

α, δ, ϵ, e, M – the right ascension and the declination of the Sun, obliquity of the ecliptic, eccentricity of the Earth's orbit and mean anomaly of the Earth, respectively;
ΔA, $\Delta\delta_0$ – constant corrections to the γ point and equator of the system within which the observations have been made (these values are actually the corrections to the right ascensions and the declinations of the stars);
ΔL_0, $\Delta\pi$, $\Delta\epsilon$ – the correction to the mean longitude of the Sun for the initial epoch, the correction to the longitude of the perigee and the obliquity of the ecliptic.

Table 3

The corrections ΔA and $\Delta\delta_0$ of the Mercury and the errors (σ) of their determination, based on the observation in the period 1975–1989.

	$0^s.001$								$0''.01$							
year	x_1	σ	y_1	σ	z_1	σ	σ_o	n	x_2	σ	y_2	σ	z_2	σ	σ_o	n
1975								5								5
1977								8								8
1978	−47	±35	53	±53	5	±43	±116	15	−11	±12	2	±17	7	±14	±38	15
1979	−25	27	−36	36	41	27	80	21	− 5	20	0	27	− 7	20	60	22
1980								5	−21	27	13	29	8	33	55	14
1981								4								5
1982	− 9	12	−19	16	− 4	18	43	20	− 7	11	− 9	15	17	16	39	20
1983	17	17	−45	30	13	13	21	6								6
1984	− 4	10	−28	18	8	12	33	12	− 7	7	17	12	− 8	8	22	13
1985	− 9	16	2	28	47	17	36	8	−27	18	−12	31	23	19	41	8
1986	9	14	−30	11	0	18	29	20	18	16	13	14	−26	21	36	20
1987								3								3
1988								5								5
1989	−18	16	−31	16	23	19	29	11	37	33	12	34	− 3	40	61	11
75–89	−14	6	−17	8	25	7	62	146	0	4	− 4	6	4	5	47	158

Since the results of our observations were regularly treated during a year the formulae proposed by Newcomb (Nemiro, 1963) are used for the calculation of the corrections of the orbital elements of the Sun

$$\Delta\alpha = -\Delta A - \cos\alpha \,\mathrm{tg}\delta\, \Delta\epsilon - 2\cos\epsilon \sec^2\delta \cos M\, e\Delta\pi$$

$$\Delta\delta = -\Delta\delta_0 + \sin\alpha\, \Delta\epsilon + \sin\epsilon \cos\alpha (1+2e\cos M)\, \Delta L_0$$

and expressions

$$\Delta\lambda = x_1 + y_1 \cos(1-L) + z_1 \sin(1-L)$$

$$\Delta\beta = x_2 + y_2 \cos(1-L) + z_2 \sin(1-L)$$

for the colculation of the corrections of the orbital elements of Mercury and Venus (McClenahan, 1952).

Table 4

The corrections ΔA and $\Delta\delta_0$ of the Venus and the errors (σ) of their determination, based on the observation in the period 1975–1989.

	$0^s.001$								$0''.01$							
year	x_1	σ	y_1	σ	z_1	σ	σ_0	n	x_2	σ	y_2	σ	z_2	σ	σ_0	n
1975	−50	±69	41	±64	−145	±82	±87	10	25	±37	−14	±34	37	±44	±47	10
1977	−29	31	53	38	0	53	92	23	−21	21	−10	26	5	36	63	23
1978	−28	26	−13	18	−34	37	76	41	2	17	−5	12	17	24	50	41
1979	8	19	−11	26	22	17	70	60	−26	14	−53	19	8	13	52	63
1980	2	26	−4	38	40	22	68	21	0	23	−8	31	−9	17	65	36
1981	12	29	10	20	6	35	46	24	90	37	−12	21	100	43	51	26
1982	1	14	−1	10	9	18	46	48	−22	14	11	11	25	18	48	48
1983	−12	14	16	16	4	13	31	32	5	20	11	23	8	19	44	32
1984	−15	15	−23	19	17	11	34	38	17	20	9	26	15	15	46	39
1985	−12	14	9	8	12	18	32	45	3	18	15	11	−12	22	41	46
1986	0	12	−9	8	3	17	34	34	9	12	2	9	−12	18	36	33
1987	16	23	4	32	−19	17	33	20	38	24	52	33	−11	18	35	20
1988	59	55	−69	77	42	31	57	18	−96	52	164	73	−47	29	54	18
1989	−71	83	−71	86	−40	42	39	19	68	88	91	92	20	45	42	19
75–89	3	3	1	4	7	4	56	438	0	2	−1	3	−3	3	50	459

l – heliocentric longitude of the planet;
L – heliocentric longitude of the Earth;
x_1 – a constant term, with an apposite sign, it represents the correction ΔA to the γ point;
x_2 – constant term representing, with an opposite sign, the correction to the equator ($\Delta\delta_0$).

4. CONCLUSION

From the data of Tables 2, 3 and 4 it is evident that the values of the correction obtained coincide one with another within the limite of the errors in position determinations. Determination errors are approximately equal for the Sun and Venus than for the Mercury. The latter fact can be explained by the unequal number of observations and also by the existence of a dependence on accuracy in the determination of zero point corrections to the mean distances to the planets.

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ПОСМАТРАЊА СУНЦА И УНУТРАШЊИХ ПЛАНЕТА СА ВЕЛИКИМ МЕРИДИЈАНСКИМ КРУГОМ У БЕОГРАДУ

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Оригинални научни рад

Дат је опис опреме и поступка посматрања, заједно са средњим вредностима (O–C) за ректасцензију и деклинацију, према годинама и са израчунатим поправкама путањских елемената. Закључује се да је квалитет посматрања задовољавајући.

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BROADENING OF LI(I) LINES BY COLLISIONS WITH CHARGED PARTICLES*

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SUMMARY: Using a semiclassical approach, we have calculated electron –, proton–, and ionized helium – impact line widths and shifts for 54 neutral lithium multiplets. Calculations have been performed as a function of temperature (T=2,500 – 40,000K) and perturber densities (10^{14} – 10^{18} cm^{-3}). The results have been used to investigate Stark–broadening parameter regularities within spectral series.

1. INTRODUCTION

Stark broadening data for neutral lithium lines are significant in astrophysics for several problems. The surface content of Li provide information on the internal structure of a star, nucleogenesis and mixing between atmosphera and interior (Boesgaard, 1988). Moreover, since the light elements like Li enter in nuclear reactions in stellar interiors where they are readily destroyed, the study of Li abundances (where Stark broadening data are needed) is therefore of interest for stellar evolution study (Boesgaard, 1988), and particularly for the deep Li depletions in the mid–F stars first shown by Boesgaard and Tripico (1986) in the Hyades. It is well known also that some carbon stars like WZ Cas, or WX Cyg have an extremely strong Li I feature (Boesgaard, 1988). Profiles of Stark broadened Li I lines may be also useful for the determination of electron concentration of laboratory plasma. An interesting example is high–density plasma produced by exploding lithium wires (Ya'akobi, 1968).

Using a semiclassical – perturbational approach (Sahal–Bréchot, 1969 a,b) we have calculated recently (Dimitrijević and Sahal–Bréchot, 1991) electron–, proton–, and ionized –helium–impact broadening parameters for all important Li I multiplets at perturber density 10^{13} cm^{-3}. For higher densities the departure from the linear density law due to Debye screening influences on the accuracy of the method (this is especially serious in the case of the shift) making that extrapolation to higher densities is sometimes difficult and inaccurate.

In order to enable such extrapolation we have calculated here Stark broadening data for 54 Li I multiplets for perturber densities 10^{14}–10^{18} cm^{-3}. The obtained comprehensive set of results has been used to investigate Stark broadening parameter regularities. Also, the obtained data have been compared with the semiclassical results of Benett and Griem (1971) (see also Griem, 1974).

* Dedicated to the memory of Dr. G. Teleki, President of the IAU Working group for Astronomical refraction and to the memory of Dr. P. Charvin, President of the Paris Observatory, who both encouraged the connections between physics and astronomy.

2. THEORY

The semiclassical perturbational formalism is described in Sahal – Bréchot (1969a, b), and only a few details are given here. For the impact approximation, the full halfwidth 2w and shift d of an electron–impact broadened line may be expressed as (Sahal–Bréchot, 1969a, b)

$$2w = N_e \int_0^\infty v\, f(v)\, dv\, [\sum_{i' \neq i} \sigma_{ii'}(v) + \sum_{f' \neq f} \sigma_{f'f}(v) + \sigma_{el}(v)],$$

$$d = N_e \int_0^\infty v\, f(v)\, dv \int_R^{R_D} 2\pi\rho\, d\rho \sin 2\phi_p. \qquad (1)$$

Here, N_e is the electron density and f(v) the Maxwellian velocity distribution function for electrons, ρ denotes the impact parameter of the incoming electron, i and f denote, respectively, the initial and final atomic energy levels, and i', f' are their perturbing levels. The inelastic cross section $\sigma_{ii'}(v)$ may be obtained from an integration over the impact parameter of the transition probability $P_{ii'}(\rho,v)$ (see e.g. Dimitrijević and Sahal–Bréchot, 1985). The elastic cross section is obtained from the integration over the impact parameter of the phase shifts ϕ_p and ϕ_q due respectively, to the polarization potential (r^{-4}) and to the quadrupolar potential (r^{-3}) parts. They are given in § of Sec. 3 in Sahal–Bréchot (1969a).

If we want to make certain that a line is isolated, we can use the parameter c defined in Dimitrijević and Sahal–Bréchot (1984) and given in Table 1. For an electron concentration lower than

$$N_l\ (cm^{-3}) = c/2w(Å)$$

where 2w is the full halfwidth at half maximum, given in table 1, the line may be treated as isolated in the core, even if a weak forbidden component due to failure of this approximation remain in the wing.

The formulae for the proton–impact (or He II – impact) widths and shifts are analogous, but inealstic collisions are negligible.

3. RESULTS AND DISCUSSION

Energy levels for Li I lines have been taken from Bashkin and Stoner (1975). Oscillator strengths have been calculated using the method of Bates and Damgaard (1949) and tables of Oertel and Shomo (1968). For higher levels, the method described by Van Regemorter et al. (1979) has been used.

In addition to the electron–impact full halfwidths and shifts, Stark broadening parameters due to proton–, and ionized helium–impact have been calculated. In such a way we provide Stark broadening data for all important charged perturbers in stellar plasma. Our results are shown in Table 1 for a perturber densities 10^{15}–10^{18} cm^{-3} and temperatures of T = 2,500; 5,000; 10,000; 20,000; 30,000 and 40,000 K. We also specify a parameter *c* (Dimitrijević and Sahal–Bréchot, 1984) which gives an estimate for the maximum perturber density for which the line may be treated as isolated when it is divided by 2W.

For each value given in Table 1, the collision volume (V) multiplied by the perturber density (N) is much less than one and the impact approximation is valid (Sahal–Bréchot, 1969ab). Values for NV > 0.5 are not give in Table 1; values for 0.1 H NV H 0.5 are denoted by an asterisk. When the impact appr
are not give in Table 1; values for 0.1 < NV < 0.5 are denoted by an asterisk. When the impact approximation is not valid, the ion broadening contribution may be estimated by using quasistatic formulae (cf. Sahal–Bréchot (1991).

The comparison of present results with available experimental data is given in Dimitrijević and Sahal–Bréchot (1991). In Table 2 our results are compared with the corresponding semiclassical calculations of Benett and Griem (1971) (see also Griem, 1974). We can see that in general, our results for the width are smaller than the results of Benett and Griem, due to different cut–offs, symmetrization procedure and different methods to take into account the elastic contribution. The large difference exists in the case of 2s–2p line shift. For this resonance line the accuracy of the semiclassical method is lower due to larger influence of short range effects. The experimental results of Purić et

Table 2

The comparison of present results for width (FWHM) (W_{DSB}) and shift (d_{DSB}) given in Å, with the corresponding results W_{BG}, d_{BG} of Benett and Griem (1971, and Griem, 1974). Plasma conditions are N = 10^{16} cm^{-3} and T = 10,000 K.

Mult.	W_{DSB}	W_{BG}	d_{DSB}	d_{BG}
2s–2p	0.025	0.028	–0.0076	–0.0044
2s–3p	0.14	0.18	0.057	0.056
2s–4p	0.44	0.57	0.16	0.17
2p–3s	0.29	0.35	0.22	0.20
2p–4s	0.46	0.57	0.35	0.31
2p–5s	0.95	1.3	0.69	0.64
2p–3d	0.38	0.43	–0.052	–0.070
2p–4d	1.81	3.0	–0.15	0.64
2p–5d	4.0	8.2	–0.24	0.30
3s–3p	11.	13.	1.4	2.1
3s–4p	7.0	8.9	1.8	2.4
3p–4s	17.	18.	5.8	4.4
3p–5s	11.	13.	6.3	5.7

Table 1

This table gives electron–, proton–, and ionized–helium– impact broadening parameters for Li I lines, for perturber densities of 10^{14}–10^{18} cm^{-3} and temperatures from 2,500 to 40,000 K. Transitions and averaged wavelengths for the multiplet (in Å) are also given. By dividing c and 2W, we obtain an estimate for the maximum perturber density for which the line may be treated as isolated and tabulated data may be used. The asterisk identifies cases for which the collision volume multiplied by the perturber density (the condition for validity of the impact approximation) lies between 0.1 and 0.5.

PERTURBER DENSITY= 0.1D+15

		ELECTRONS		PROTONS		IONIZED HELIUM	
TRANSITION	T(K)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)	WIDTH(A)	SHIFT(A)
2S - 2P	2500.	0.230E-03	-0.588E-04	0.113E-03	-0.165E-04	0.113E-03	-0.138E-04
6709.6 A	5000.	0.234E-03	-0.691E-04	0.113E-03	-0.185E-04	0.113E-03	-0.155E-04
C= 0.55D+20	10000.	0.254E-03	-0.755E-04	0.113E-03	-0.208E-04	0.113E-03	-0.174E-04
	20000.	0.319E-03	-0.745E-04	0.113E-03	-0.233E-04	0.113E-03	-0.195E-04
	30000.	0.378E-03	-0.646E-04	0.113E-03	-0.249E-04	0.113E-03	-0.209E-04
	40000.	0.428E-03	-0.581E-04	0.113E-03	-0.262E-04	0.113E-03	-0.219E-04
2S - 3P	2500.	0.122E-02	0.857E-03	0.323E-03	0.267E-03	0.282E-03	0.223E-03
3233.6 A	5000.	0.130E-02	0.740E-03	0.356E-03	0.303E-03	0.308E-03	0.253E-03
C= 0.37D+18	10000.	0.140E-02	0.586E-03	0.392E-03	0.342E-03	0.338E-03	0.286E-03
	20000.	0.142E-02	0.449E-03	0.435E-03	0.385E-03	0.372E-03	0.323E-03
	30000.	0.142E-02	0.360E-03	0.463E-03	0.413E-03	0.395E-03	0.346E-03
	40000.	0.141E-02	0.299E-03	0.484E-03	0.433E-03	0.412E-03	0.363E-03
2S - 4P	2500.	0.399E-02	0.265E-02	0.101E-02	0.850E-03	0.870E-03	0.704E-03
2742.0 A	5000.	0.420E-02	0.217E-02	0.112E-02	0.975E-03	0.960E-03	0.811E-03
C= 0.12D+18	10000.	0.444E-02	0.171E-02	0.125E-02	0.111E-02	0.106E-02	0.925E-03
	20000.	0.441E-02	0.122E-02	0.139E-02	0.126E-02	0.118E-02	0.105E-02
	30000.	0.435E-02	0.937E-03	0.149E-02	0.135E-02	0.126E-02	0.113E-02
	40000.	0.429E-02	0.747E-03	0.156E-02	0.142E-02	0.131E-02	0.119E-02
2S - 5P	2500.	0.103E-01	0.650E-02	0.262E-02	0.215E-02	0.224E-02*	0.176E-02*
2563.1 A	5000.	0.109E-01	0.496E-02	0.292E-02	0.250E-02	0.248E-02*	0.207E-02*
C= 0.52D+17	10000.	0.114E-01	0.399E-02	0.326E-02	0.288E-02	0.276E-02	0.239E-02
	20000.	0.111E-01	0.252E-02	0.365E-02	0.328E-02	0.308E-02	0.274E-02
	30000.	0.109E-01	0.184E-02	0.390E-02	0.353E-02	0.328E-02	0.295E-02
	40000.	0.107E-01	0.139E-02	0.410E-02	0.372E-02	0.344E-02	0.311E-02
2S - 6P	2500.	0.225E-01	0.120E-01	0.582E-02*	0.452E-02*		
2475.8 A	5000.	0.242E-01	0.970E-02	0.650E-02*	0.541E-02*	0.550E-02*	0.444E-02*
C= 0.28D+17	10000.	0.248E-01	0.685E-02	0.726E-02*	0.631E-02*	0.613E-02*	0.523E-02*
	20000.	0.240E-01	0.430E-02	0.814E-02*	0.725E-02*	0.685E-02*	0.603E-02*
	30000.	0.235E-01	0.309E-02	0.871E-02	0.783E-02	0.731E-02*	0.653E-02*
	40000.	0.229E-01	0.238E-02	0.916E-02	0.826E-02	0.766E-02*	0.689E-02*
2S - 7P	2500.	0.447E-01	0.234E-01				
2426.2 A	5000.	0.479E-01	0.184E-01				
C= 0.17D+17	10000.	0.482E-01	0.128E-01				
	20000.	0.467E-01	0.654E-02	0.164E-01*	0.144E-01*		
	30000.	0.454E-01	0.464E-02	0.175E-01*	0.156E-01*		
	40000.	0.441E-01	0.280E-02	0.185E-01*	0.165E-01*	0.154E-01*	0.137E-01*
2P - 3S	2500.	0.222E-02	0.165E-02	0.521E-03	0.468E-03	0.444E-03	0.391E-03
8128.7 A	5000.	0.261E-02	0.197E-02	0.580E-03	0.527E-03	0.492E-03	0.441E-03
C= 0.25D+20	10000.	0.293E-02	0.220E-02	0.646E-03	0.593E-03	0.548E-03	0.497E-03
	20000.	0.312E-02	0.224E-02	0.722E-03	0.667E-03	0.610E-03	0.559E-03
	30000.	0.329E-02	0.225E-02	0.770E-03	0.714E-03	0.650E-03	0.598E-03
	40000.	0.334E-02	0.206E-02	0.807E-03	0.750E-03	0.681E-03	0.628E-03
2P - 4S	2500.	0.355E-02	0.268E-02	0.803E-03	0.737E-03	0.673E-03	0.614E-03
4973.1 A	5000.	0.418E-02	0.317E-02	0.901E-03	0.837E-03	0.756E-03	0.699E-03
C= 0.36D+19	10000.	0.455E-02	0.356E-02	0.101E-02	0.946E-03	0.848E-03	0.792E-03
	20000.	0.475E-02	0.351E-02	0.113E-02	0.107E-02	0.951E-03	0.892E-03
	30000.	0.482E-02	0.323E-02	0.121E-02	0.114E-02	0.102E-02	0.956E-03
	40000.	0.493E-02	0.299E-02	0.127E-02	0.120E-02	0.107E-02	0.100E-02

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
2P - 5S	2500.	0.796E-02	0.588E-02	0.174E-02	0.157E-02	0.146E-02	0.130E-02
4274.3 A	5000.	0.905E-02	0.684E-02	0.195E-02	0.179E-02	0.163E-02	0.149E-02
C= 0.13D+19	10000.	0.947E-02	0.718E-02	0.219E-02	0.203E-02	0.184E-02	0.170E-02
	20000.	0.992E-02	0.683E-02	0.246E-02	0.230E-02	0.206E-02	0.192E-02
	30000.	0.102E-01	0.582E-02	0.263E-02	0.247E-02	0.220E-02	0.207E-02
	40000.	0.107E-01	0.540E-02	0.276E-02	0.259E-02	0.231E-02	0.217E-02
2P - 6S	2500.	0.172E-01	0.125E-01	0.362E-02	0.317E-02	0.303E-02	0.261E-02
3986.7 A	5000.	0.191E-01	0.146E-01	0.406E-02	0.366E-02	0.340E-02	0.304E-02
C= 0.64D+18	10000.	0.209E-01	0.145E-01	0.456E-02	0.419E-02	0.382E-02	0.349E-02
	20000.	0.202E-01	0.120E-01	0.512E-02	0.475E-02	0.429E-02	0.397E-02
	30000.	0.215E-01	0.100E-01	0.548E-02	0.511E-02	0.459E-02	0.427E-02
	40000.	0.225E-01	0.848E-02	0.574E-02	0.538E-02	0.481E-02	0.450E-02
2P - 7S	2500.	0.328E-01	0.239E-01	0.694E-02*	0.586E-02*	0.582E-02*	0.480E-02*
3836.7 A	5000.	0.350E-01	0.268E-01	0.780E-02	0.688E-02	0.653E-02*	0.568E-02*
C= 0.37D+18	10000.	0.379E-01	0.265E-01	0.875E-02	0.793E-02	0.733E-02*	0.659E-02*
	20000.	0.395E-01	0.199E-01	0.983E-02	0.905E-02	0.823E-02	0.754E-02
	30000.	0.418E-01	0.161E-01	0.105E-01	0.975E-02	0.881E-02	0.814E-02
	40000.	0.437E-01	0.127E-01	0.110E-01	0.103E-01	0.925E-02	0.857E-02
2P - 8S	2500.	0.633E-01	0.440E-01	0.125E-01*	0.100E-01*		
3747.7 A	5000.	0.654E-01	0.466E-01	0.140E-01*	0.120E-01*	0.117E-01*	0.986E-02*
C= 0.23D+18	10000.	0.652E-01	0.437E-01	0.157E-01*	0.140E-01*	0.132E-01*	0.116E-01*
	20000.	0.707E-01	0.307E-01	0.176E-01*	0.161E-01*	0.148E-01*	0.134E-01*
	30000.	0.778E-01	0.248E-01	0.189E-01	0.174E-01	0.158E-01*	0.145E-01*
	40000.	0.798E-01	0.198E-01	0.198E-01	0.183E-01	0.166E-01*	0.153E-01*
2P - 3D	2500.	0.339E-02	-0.149E-02	0.741E-03	-0.635E-03	0.640E-03	-0.530E-03
6105.3 A	5000.	0.368E-02	-0.988E-03	0.819E-03	-0.720E-03	0.704E-03	-0.601E-03
C= 0.13D+19	10000.	0.375E-02	-0.552E-03	0.909E-03	-0.811E-03	0.776E-03	-0.679E-03
	20000.	0.365E-02	-0.163E-03	0.101E-02	-0.913E-03	0.860E-03	-0.764E-03
	30000.	0.359E-02	0.118E-04	0.108E-02	-0.978E-03	0.914E-03	-0.819E-03
	40000.	0.354E-02	0.673E-04	0.113E-02	-0.103E-02	0.956E-03	-0.860E-03
2P - 4D	2500.	0.298E-01	0.375E-05	0.138E-01*	0.112E-01*	0.114E-01*	0.914E-02*
4604.2 A	5000.	0.272E-01	-0.114E-03	0.159E-01*	0.133E-01*	0.129E-01*	0.109E-01*
C= 0.14D+17	10000.	0.242E-01	-0.360E-03	0.182E-01*	0.158E-01*	0.148E-01*	0.128E-01*
	20000.	0.210E-01	-0.447E-03	0.197E-01	0.192E-01	0.170E-01*	0.148E-01*
	30000.	0.193E-01	-0.227E-03	0.185E-01	0.206E-01	0.183E-01*	0.163E-01*
	40000.	0.181E-01	-0.117E-03	0.178E-01	0.223E-01	0.191E-01	0.175E-01
2P - 5D	2500.	0.623E-01	0.354E-02	0.198E-01*	0.154E-01*		
4133.8 A	5000.	0.601E-01	0.208E-02	0.224E-01*	0.186E-01*		
C= 0.16D+17	10000.	0.553E-01	0.753E-03	0.257E-01*	0.219E-01*	0.210E-01*	0.181E-01*
	20000.	0.491E-01	-0.156E-03	0.296E-01*	0.256E-01*	0.239E-01*	0.209E-01*
	30000.	0.453E-01	-0.726E-03	0.317E-01*	0.284E-01*	0.259E-01*	0.227E-0!*
	40000.	0.426E-01	0.556E-03	0.354E-01*	0.315E-01*	0.275E-01*	0.242E-01*
2P - 6D	2500.	0.160	-0.988E-02				
3916.5 A	5000.	0.148	-0.721E-02				
C= 0.24D+16	10000.	0.132	-0.516E-02				
	20000.	0.114	-0.226E-02				
	30000.	0.104	-0.107E-02				
	40000.	0.969E-01	-0.219E-03				

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
2P - 7D	2500.	0.276	-0.222E-01				
3796.1 A	5000.	0.261	-0.168E-01				
C= 0.17D+16	10000.	0.235	-0.900E-02				
	20000.	0.205	-0.408E-02				
	30000.	0.188	-0.211E-02				
	40000.	0.175	-0.167E-02				
3S - 3P	2500.	0.811E-01	0.422E-01	0.207E-01	0.167E-01	0.182E-01	0.139E-01
26887.1 A	5000.	0.981E-01	0.273E-01	0.226E-01	0.189E-01	0.197E-01	0.158E-01
C= 0.26D+20	10000.	0.112	0.137E-01	0.249E-01	0.214E-01	0.215E-01	0.179E-01
	20000.	0.119	0.320E-02	0.275E-01	0.241E-01	0.236E-01	0.201E-01
	30000.	0.122	-0.751E-03	0.292E-01	0.258E-01	0.250E-01	0.216E-01
	40000.	0.123	-0.200E-02	0.306E-01	0.271E-01	0.261E-01	0.227E-01
3S - 4P	2500.	0.614E-01	0.398E-01	0.156E-01	0.130E-01	0.134E-01	0.108E-01
10795.1 A	5000.	0.654E-01	0.298E-01	0.173E-01	0.150E-01	0.148E-01	0.125E-01
C= 0.18D+19	10000.	0.704E-01	0.197E-01	0.192E-01	0.170E-01	0.163E-01	0.142E-01
	20000.	0.708E-01	0.133E-01	0.214E-01	0.193E-01	0.181E-01	0.161E-01
	30000.	0.706E-01	0.725E-02	0.228E-01	0.207E-01	0.193E-01	0.173E-01
	40000.	0.701E-01	0.533E-02	0.240E-01	0.218E-01	0.202E-01	0.182E-01
3S - 5P	2500.	0.112	0.703E-01	0.286E-01	0.234E-01	0.244E-01*	0.192E-01*
8467.8 A	5000.	0.119	0.536E-01	0.318E-01	0.273E-01	0.271E-01*	0.226E-01*
C= 0.57D+18	10000.	0.125	0.360E-01	0.355E-01	0.314E-01	0.301E-01	0.261E-01
	20000.	0.123	0.224E-01	0.397E-01	0.357E-01	0.335E-01	0.298E-01
	30000.	0.121	0.956E-02	0.425E-01	0.385E-01	0.357E-01	0.321E-01
	40000.	0.119	0.830E-02	0.446E-01	0.405E-01	0.374E-01	0.338E-01
3S - 6P	2500.	0.211	0.123	0.546E-01*	0.424E-01*		
7584.5 A	5000.	0.227	0.952E-01	0.610E-01*	0.508E-01*	0.516E-01*	0.417E-01*
C= 0.27D+18	10000.	0.233	0.697E-01	0.681E-01*	0.592E-01*	0.575E-01*	0.490E-01*
	20000.	0.227	0.384E-01	0.763E-01*	0.681E-01*	0.642E-01*	0.566E-01*
	30000.	0.222	0.280E-01	0.817E-01	0.737E-01	0.686E-01*	0.612E-01*
	40000.	0.217	0.124E-01	0.860E-01	0.775E-01	0.718E-01*	0.646E-01*
3S - 7P	2500.	0.387	0.203				
7137.1 A	5000.	0.415	0.160				
C= 0.15D+18	10000.	0.418	0.110				
	20000.	0.405	0.621E-01	0.142*	0.124*		
	30000.	0.394	0.435E-01	0.152*	0.135*		
	40000.	0.384	0.262E-01	0.160*	0.142*	0.133*	0.119*
3P - 4S	2500.	0.109	0.298E-01	0.109E-01	0.635E-02	0.104E-01	0.530E-02
24469.7 A	5000.	0.143	0.449E-01	0.114E-01	0.718E-02	0.107E-01	0.601E-02
C= 0.21D+20	10000.	0.166	0.585E-01	0.120E-01	0.808E-02	0.111E-01	0.677E-02
	20000.	0.181	0.640E-01	0.126E-01	0.910E-02	0.117E-01	0.762E-02
	30000.	0.186	0.599E-01	0.130E-01	0.981E-02	0.120E-01	0.816E-02
	40000.	0.190	0.555E-01	0.131E-01	0.103E-01	0.123E-01	0.857E-02
3P - 5S	2500.	0.872E-01	0.537E-01	0.158E-01	0.141E-01	0.133E-01	0.117E-01
13560.9 A	5000.	0.103	0.644E-01	0.177E-01	0.161E-01	0.149E-01	0.134E-01
C= 0.66D+19	10000.	0.112	0.655E-01	0.198E-01	0.183E-01	0.167E-01	0.153E-01
	20000.	0.120	0.623E-01	0.222E-01	0.207E-01	0.187E-01	0.173E-01
	30000.	0.124	0.550E-01	0.238E-01	0.222E-01	0.200E-01	0.186E-01
	40000.	0.129	0.490E-01	0.249E-01	0.233E-01	0.209E-01	0.195E-01

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
3P - 6S	2500.	0.135	0.943E-01	0.270E-01	0.236E-01	0.226E-01	0.195E-01
11034.8 A	5000.	0.151	0.108	0.302E-01	0.273E-01	0.254E-01	0.226E-01
C= 0.44D+19	10000.	0.160	0.103	0.339E-01	0.312E-01	0.285E-01	0.260E-01
	20000.	0.168	0.887E-01	0.381E-01	0.354E-01	0.319E-01	0.295E-01
	30000.	0.178	0.732E-01	0.408E-01	0.381E-01	0.342E-01	0.318E-01
	40000.	0.187	0.629E-01	0.428E-01	0.401E-01	0.359E-01	0.335E-01
3P - 7S	2500.	0.225	0.160	0.463E-01*	0.391E-01*	0.388E-01*	0.320E-01*
9957.7 A	5000.	0.242	0.179	0.520E-01	0.459E-01	0.436E-01*	0.379E-01*
C= 0.25D+19	10000.	0.263	0.172	0.584E-01	0.529E-01	0.489E-01*	0.440E-01*
	20000.	0.273	0.121	0.656E-01	0.604E-01	0.549E-01	0.503E-01
	30000.	0.293	0.978E-01	0.702E-01	0.651E-01	0.588E-01	0.543E-01
	40000.	0.306	0.866E-01	0.737E-01	0.685E-01	0.617E-01	0.572E-01
3P - 8S	2500.	0.372	0.276	0.778E-01*	0.627E-01*		
9379.3 A	5000.	0.392	0.291	0.873E-01*	0.750E-01*	0.732E-01*	0.616E-01*
C= 0.14D+19	10000.	0.415	0.260	0.980E-01*	0.873E-01*	0.821E-01*	0.723E-01*
	20000.	0.453	0.166	0.110*	0.100*	0.922E-01*	0.835E-01*
	30000.	0.487	0.137	0.118	0.108	0.987E-01*	0.903E-01*
	40000.	0.509	0.123	0.124	0.114	0.104*	0.953E-01*
3P - 3D	2500.	15.6	-8.97	3.01	-2.65	2.57	-2.21
279548.3 A	5000.	16.1	-7.09	3.36	-3.01	2.85	-2.51
C= 0.28D+22	10000.	17.0	-5.07	3.74	-3.41	3.17	-2.85
	20000.	16.9	-3.70	4.18	-3.84	3.53	-3.21
	30000.	16.6	-2.64	4.47	-4.12	3.77	-3.45
	40000.	16.4	-2.13	4.69	-4.32	3.94	-3.62
3P - 4D	2500.	0.466	-0.218E-01	0.200*	0.162*	0.165*	0.132*
17550.0 A	5000.	0.426	-0.239E-01	0.230*	0.192*	0.187*	0.158*
C= 0.21D+18	10000.	0.387	-0.263E-01	0.263*	0.227*	0.213*	0.184*
	20000.	0.340	-0.154E-01	0.282	0.278	0.246*	0.214*
	30000.	0.314	-0.104E-01	0.266	0.297	0.266*	0.236*
	40000.	0.296	-0.729E-02	0.252	0.321	0.275	0.253
3P - 5D	2500.	0.560	0.220E-01	0.173*	0.135*		
12240.6 A	5000.	0.540	0.246E-02	0.196*	0.163*		
C= 0.14D+18	10000.	0.501	0.128E-02	0.225*	0.189*	0.183*	0.158*
	20000.	0.446	-0.473E-02	0.259*	0.224*	0.209*	0.183*
	30000.	0.413	-0.166E-03	0.277*	0.248*	0.227*	0.199*
	40000.	0.389	0.198E-02	0.309*	0.276*	0.241*	0.212*
3P - 6D	2500.	1.16	-0.784E-01				
10513.1 A	5000.	1.08	-0.602E-01				
C= 0.17D+17	10000.	0.959	-0.427E-01				
	20000.	0.832	-0.178E-01				
	30000.	0.760	-0.712E-02				
	40000.	0.710	-0.837E-02				
3P - 7D	2500.	1.80	-0.146				
9688.9 A	5000.	1.71	-0.110				
C= 0.11D+17	10000.	1.54	-0.724E-01				
	20000.	1.35	-0.291E-01				
	30000.	1.23	-0.135E-01				
	40000.	1.15	-0.595E-02				

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
3D - 4P	2500.	0.228	0.138	0.511E-01	0.435E-01	0.437E-01	0.360E-01
19281.0 A	5000.	0.237	0.116	0.569E-01	0.499E-01	0.484E-01	0.415E-01
C= 0.57D+19	10000.	0.249	0.864E-01	0.634E-01	0.568E-01	0.538E-01	0.474E-01
	20000.	0.247	0.571E-01	0.708E-01	0.644E-01	0.599E-01	0.538E-01
	30000.	0.242	0.438E-01	0.757E-01	0.691E-01	0.638E-01	0.579E-01
	40000.	0.238	0.278E-01	0.794E-01	0.726E-01	0.668E-01	0.608E-01
3D - 5P	2500.	0.276	0.171	0.670E-01	0.550E-01	0.571E-01*	0.451E-01*
12932.5 A	5000.	0.291	0.132	0.747E-01	0.642E-01	0.634E-01*	0.531E-01*
C= 0.13D+19	10000.	0.303	0.977E-01	0.833E-01	0.738E-01	0.705E-01	0.614E-01
	20000.	0.296	0.589E-01	0.933E-01	0.841E-01	0.786E-01	0.701E-01
	30000.	0.290	0.449E-01	0.998E-01	0.905E-01	0.839E-01	0.756E-01
	40000.	0.284	0.331E-01	0.105	0.954E-01	0.879E-01	0.796E-01
3D - 6P	2500.	0.452	0.262	0.115*	0.891E-01*		
10979.7 A	5000.	0.484	0.198	0.128*	0.107*	0.108*	0.876E-01*
C= 0.56D+18	10000.	0.496	0.152	0.143*	0.124*	0.121*	0.103*
	20000.	0.482	0.840E-01	0.160*	0.143*	0.135*	0.119*
	30000.	0.470	0.625E-01	0.171	0.154	0.144*	0.129*
	40000.	0.459	0.487E-01	0.180	0.163	0.151*	0.136*
3D - 7P	2500.	0.776	0.406				
10066.2 A	5000.	0.832	0.318				
C= 0.30D+18	10000.	0.837	0.226				
	20000.	0.811	0.123	0.282*	0.247*		
	30000.	0.788	0.928E-01	0.302*	0.268*		
	40000.	0.767	0.686E-01	0.318*	0.283*	0.265*	0.236*
4S - 4P	2500.	2.51	1.15	0.585	0.486	0.505	0.403
68611.1 A	5000.	3.00	0.646	0.647	0.557	0.555	0.464
C= 0.72D+20	10000.	3.30	0.360	0.719	0.634	0.613	0.529
	20000.	3.44	-0.241E-01	0.801	0.718	0.680	0.600
	30000.	3.48	-0.119	0.855	0.771	0.723	0.645
	40000.	3.50	-0.192	0.896	0.809	0.756	0.678
4S - 5P	2500.	0.973	0.526	0.245	0.201	0.209*	0.165*
24978.1 A	5000.	1.07	0.366	0.273	0.234	0.232*	0.194*
C= 0.50D+19	10000.	1.14	0.255	0.305	0.269	0.258	0.224
	20000.	1.14	0.100	0.341	0.307	0.288	0.256
	30000.	1.13	0.448E-01	0.365	0.330	0.307	0.275
	40000.	1.12	0.159E-01	0.383	0.347	0.321	0.290
4S - 6P	2500.	1.27	0.667	0.327*	0.254*		
18591.6 A	5000.	1.38	0.324	0.365*	0.304*	0.309*	0.250*
C= 0.16D+19	10000.	1.42	0.311	0.408*	0.354*	0.344*	0.293*
	20000.	1.40	0.972E-01	0.457*	0.407*	0.384*	0.339*
	30000.	1.37	0.679E-01	0.489	0.440	0.410*	0.366*
	40000.	1.35	0.465E-01	0.515	0.464	0.430*	0.387*
4S - 7P	2500.	1.97	0.991				
16115.3 A	5000.	2.13	0.728				
C= 0.76D+18	10000.	2.14	0.447				
	20000.	2.09	0.134	0.721*	0.633*		
	30000.	2.04	0.104	0.773*	0.686*		
	40000.	1.99	0.854E-01	0.813*	0.725*	0.678*	0.604*

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
4P - 5S	2500.	2.12	0.730E-01	0.234	-0.170	0.211	-0.141
54645.4 A	5000.	2.62	0.391	0.253	-0.194	0.225	-0.161
C= 0.46D+20	10000.	2.97	0.583	0.275	-0.220	0.242	-0.183
	20000.	3.19	0.724	0.302	-0.248	0.263	-0.208
	30000.	3.28	0.653	0.322	-0.266	0.276	-0.222
	40000.	3.36	0.596	0.339	-0.279	0.287	-0.234
4P - 6S	2500.	1.03	0.470	0.134	0.114	0.114	0.945E-01
28424.5 A	5000.	1.23	0.588	0.149	0.131	0.127	0.109
C= 0.12D+20	10000.	1.36	0.570	0.166	0.150	0.141	0.125
	20000.	1.45	0.510	0.186	0.170	0.157	0.142
	30000.	1.52	0.422	0.198	0.183	0.167	0.153
	40000.	1.57	0.375	0.207	0.192	0.175	0.161
4P - 7S	2500.	1.21	0.745	0.212*	0.179*	0.178*	0.147*
22230.4 A	5000.	1.35	0.819	0.238	0.210	0.200*	0.173*
C= 0.76D+19	10000.	1.46	0.797	0.267	0.242	0.224	0.201
	20000.	1.56	0.573	0.299	0.275	0.251	0.230
	30000.	1.67	0.431	0.320	0.297	0.269	0.248
	40000.	1.73	0.373	0.336	0.312	0.282	0.261
4P - 8S	2500.	1.68	1.11	0.327*	0.264*		
19540.6 A	5000.	1.80	1.19	0.367*	0.315*	0.308*	0.259*
C= 0.59D+19	10000.	1.93	1.09	0.412*	0.367*	0.345*	0.304*
	20000.	2.12	0.714	0.462*	0.422*	0.388*	0.351*
	30000.	2.27	0.452	0.495	0.455	0.415*	0.379*
	40000.	2.34	0.401	0.519	0.480	0.435*	0.400*
4P - 5D	2500.	6.03	-0.125	1.64*	1.28*		
38089.6 A	5000.	5.80	-0.220	1.86*	1.55*		
C= 0.14D+19	10000.	5.47	-0.278	2.13*	1.81*	1.74*	1.50*
	20000.	4.92	-0.134	2.46*	2.13*	1.98*	1.74*
	30000.	4.57	-0.557E-01	2.62*	2.35*	2.16*	1.88*
	40000.	4.33	-0.875E-01	2.70*	2.52*	2.28*	2.00*
4P - 6D	2500.	6.95	-0.585				
25203.1 A	5000.	6.43	-0.410				
C= 0.98D+17	10000.	5.78	-0.271				
	20000.	5.04	-0.164				
	30000.	4.61	-0.284E-01				
	40000.	4.32	-0.144E-01				
4P - 7D	2500.	8.58	-0.778				
20933.9 A	5000.	8.12	-0.552				
C= 0.50D+17	10000.	7.36	-0.338				
	20000.	6.45	-0.133				
	30000.	5.92	-0.595E-01				
	40000.	5.54	-0.838E-02				
4D - 5P	2500.	5.18	1.57	0.797*	-0.629*	0.651*	-0.515*
41803.2 A	5000.	5.04	1.20	0.930	-0.755	0.739*	-0.608*
C= 0.12D+19	10000.	4.92	0.917	1.02	-0.909	0.858*	-0.708*
	20000.	4.60	0.498	0.959	-1.02	0.987	-0.835
	30000.	4.38	0.317	0.949	-0.966	1.02	-0.929
	40000.	4.22	0.262	0.944	-0.995	1.08	-1.04

PERTURBER DENSITY= 0.1D+15

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
4D - 6P	2500.	3.56	1.48	0.384*	0.305*	0.341*	0.249*
26543.2 A	5000.	3.63	1.10	0.407	0.353	0.370*	0.295*
C= 0.48D+18	10000.	3.61	0.719	0.443	0.390	0.395*	0.342*
	20000.	3.42	0.293	0.520	0.427	0.421	0.381
	30000.	3.29	0.222	0.598	0.455	0.446	0.400
	40000.	3.19	0.183	0.669	0.485	0.473	0.415
4D - 7P	2500.	4.23	1.88				
21767.8 A	5000.	4.42	1.44				
C= 0.32D+18	10000.	4.39	0.869	1.01*	0.869*		
	20000.	4.19	0.575	1.13*	1.00*		
	30000.	4.05	0.241	1.22*	1.08*	1.02*	0.907*
	40000.	3.93	0.205	1.29*	1.14*	1.06*	0.958*
5S - 6P	2500.	8.60	4.10	2.13*	1.65*		
47816.9 A	5000.	9.60	2.76	2.37*	1.98*	2.01*	1.62*
C= 0.11D+20	10000.	9.96	1.61	2.65*	2.30*	2.24*	1.91*
	20000.	9.96	0.594	2.97*	2.65*	2.50*	2.20*
	30000.	9.89	0.270	3.18	2.86	2.67*	2.38*
	40000.	9.78	-0.158	3.35	3.01	2.80*	2.51*
5S - 7P	2500.	9.02	4.19				
34272.2 A	5000.	9.82	2.82				
C= 0.34D+19	10000.	9.96	1.58				
	20000.	9.81	0.541	3.24*	2.85*		
	30000.	9.62	0.316	3.48*	3.09*		
	40000.	9.42	0.182	3.66*	3.26*	3.05*	2.72*
5P - 7S	2500.	7.86	2.49	0.603	0.457	0.534	0.377
51220.6 A	5000.	9.31	3.25	0.658	0.527	0.578	0.438
C= 0.21D+20	10000.	10.4	3.33	0.719	0.602	0.628	0.501
	20000.	11.1	2.49	0.783	0.683	0.686	0.570
	30000.	11.6	2.05	0.818	0.737	0.723	0.613
	40000.	11.9	1.70	0.839	0.774	0.749	0.646
5P - 8S	2500.	7.45	3.87	1.09*	0.883*	0.918*	0.718*
38887.2 A	5000.	8.35	4.12	1.22*	1.05*	1.03*	0.862*
C= 0.12D+20	10000.	9.15	3.86	1.37*	1.22*	1.15*	1.01*
	20000.	9.97	2.47	1.53	1.39	1.29*	1.16*
	30000.	10.6	1.65	1.64	1.50	1.38*	1.25*
	40000.	10.8	1.44	1.72	1.58	1.44	1.32

PERTURBER DENSITY= 0.1D+16

2S - 2P	2500.	0.230E-02	-0.587E-03	0.113E-02	-0.164E-03	0.112E-02	-0.137E-03
6709.6 A	5000.	0.234E-02	-0.691E-03	0.113E-02	-0.184E-03	0.113E-02	-0.154E-03
C= 0.55D+20	10000.	0.254E-02	-0.755E-03	0.113E-02	-0.207E-03	0.113E-02	-0.174E-03
	20000.	0.319E-02	-0.745E-03	0.113E-02	-0.233E-03	0.113E-02	-0.195E-03
	30000.	0.378E-02	-0.646E-03	0.113E-02	-0.249E-03	0.113E-02	-0.209E-03
	40000.	0.428E-02	-0.581E-03	0.113E-02	-0.262E-03	0.113E-02	-0.219E-03
2S - 3P	2500.	0.122E-01	0.844E-02	0.323E-02	0.251E-02	0.282E-02	0.207E-02
3233.6 A	5000.	0.130E-01	0.736E-02	0.355E-02	0.292E-02	0.308E-02	0.242E-02
C= 0.37D+18	10000.	0.140E-01	0.584E-02	0.392E-02	0.334E-02	0.338E-02	0.278E-02
	20000.	0.142E-01	0.449E-02	0.435E-02	0.380E-02	0.372E-02	0.317E-02
	30000.	0.142E-01	0.360E-02	0.463E-02	0.409E-02	0.395E-02	0.341E-02
	40000.	0.141E-01	0.299E-02	0.484E-02	0.430E-02	0.412E-02	0.359E-02

PERTURBER DENSITY= 0.1D+16

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
2S - 4P	2500.	0.399E-01	0.256E-01	0.101E-01*	0.740E-02*	0.866E-02*	0.595E-02*
2742.0 A	5000.	0.420E-01	0.213E-01	0.112E-01*	0.897E-02*	0.959E-02*	0.734E-02*
C= 0.12D+18	10000.	0.444E-01	0.169E-01	0.125E-01	0.105E-01	0.106E-01*	0.871E-02*
	20000.	0.441E-01	0.122E-01	0.139E-01	0.122E-01	0.118E-01*	0.101E-01*
	30000.	0.435E-01	0.935E-02	0.149E-01	0.132E-01	0.126E-01	0.110E-01
	40000.	0.429E-01	0.747E-02	0.156E-01	0.139E-01	0.131E-01	0.116E-01
2563.1 A	5000.	0.109	0.477E-01				
C= 0.52D+17	10000.	0.114	0.386E-01	0.326E-01*	0.263E-01*		
	20000.	0.111	0.250E-01	0.364E-01*	0.310E-01*		
	30000.	0.109	0.183E-01	0.390E-01*	0.339E-01*	0.328E-01*	0.280E-01*
	40000.	0.107	0.138E-01	0.409E-01*	0.359E-01*	0.343E-01*	0.298E-01*
2S - 6P	2500.	0.224	0.111				
2475.8 A	5000.	0.240	0.905E-01				
C= 0.28D+17	10000.	0.247	0.673E-01				
	20000.	0.240	0.422E-01				
	30000.	0.234	0.303E-01				
	40000.	0.229	0.234E-01				
2S - 7P	2500.	0.431	0.178				
2426.2 A	5000.	0.468	0.150				
C= 0.17D+17	10000.	0.474	0.114				
	20000.	0.461	0.630E-01				
	30000.	0.449	0.445E-01				
	40000.	0.438	0.280E-01				
2P - 3S	2500.	0.222E-01	0.164E-01	0.520E-02	0.453E-02	0.443E-02	0.376E-02
8128.7 A	5000.	0.261E-01	0.196E-01	0.580E-02	0.517E-02	0.492E-02	0.431E-02
C= 0.25D+20	10000.	0.293E-01	0.220E-01	0.647E-02	0.586E-02	0.548E-02	0.490E-02
	20000.	0.312E-01	0.224E-01	0.722E-02	0.663E-02	0.610E-02	0.555E-02
	30000.	0.329E-01	0.225E-01	0.770E-02	0.711E-02	0.650E-02	0.595E-02
	40000.	0.334E-01	0.206E-01	0.807E-02	0.746E-02	0.681E-02	0.625E-02
2P - 4S	2500.	0.355E-01	0.264E-01	0.803E-02	0.690E-02	0.673E-02	0.568E-02
4973.1 A	5000.	0.418E-01	0.315E-01	0.901E-02	0.803E-02	0.755E-02	0.665E-02
C= 0.36D+19	10000.	0.455E-01	0.355E-01	0.101E-01	0.922E-02	0.847E-02	0.767E-02
	20000.	0.475E-01	0.351E-01	0.113E-01	0.105E-01	0.951E-02	0.875E-02
	30000.	0.482E-01	0.322E-01	0.121E-01	0.113E-01	0.102E-01	0.943E-02
	40000.	0.493E-01	0.299E-01	0.127E-01	0.119E-01	0.107E-01	0.993E-02
2P - 5S	2500.	0.796E-01	0.571E-01	0.174E-01*	0.139E-01*	0.146E-01*	0.113E-01*
4274.3 A	5000.	0.905E-01	0.673E-01	0.195E-01	0.167E-01	0.163E-01*	0.137E-01*
C= 0.13D+19	10000.	0.947E-01	0.713E-01	0.219E-01	0.195E-01	0.183E-01	0.161E-01
	20000.	0.992E-01	0.682E-01	0.246E-01	0.224E-01	0.206E-01	0.186E-01
	30000.	0.102	0.581E-01	0.263E-01	0.242E-01	0.220E-01	0.201E-01
	40000.	0.107	0.540E-01	0.276E-01	0.255E-01	0.231E-01	0.213E-01
2P - 6S	2500.	0.172	0.120	0.361E-01*	0.261E-01*		
3986.7 A	5000.	0.191	0.143	0.406E-01*	0.327E-01*	0.340E-01*	0.264E-01*
C= 0.64D+18	10000.	0.209	0.145	0.456E-01*	0.391E-01*	0.382E-01*	0.321E-01*
	20000.	0.202	0.120	0.511E-01*	0.455E-01*	0.429E-01*	0.377E-01*
	30000.	0.215	0.100	0.547E-01*	0.495E-01*	0.459E-01*	0.411E-01*
	40000.	0.225	0.846E-01	0.574E-01*	0.523E-01*	0.481E-01*	0.435E-01*

PERTURBER DENSITY= 0.1D+16

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
2P - 7S	2500.	0.328	0.224				
3836.7 A	5000.	0.350	0.260				
C= 0.37D+18	10000.	0.379	0.263				
	20000.	0.395	0.199	0.982E-01*	0.850E-01*		
	30000.	0.418	0.161	0.105*	0.930E-01*		
	40000.	0.437	0.127	0.110*	0.988E-01*		
2P - 8S	2500.	0.633	0.402				
3747.7 A	5000.	0.654	0.444				
C= 0.23D+18	10000.	0.652	0.430				
	20000.	0.707	0.306				
	30000.	0.778	0.248				
	40000.	0.798	0.198				
2P - 3D	2500.	0.339E-01	-0.146E-01	0.740E-02	-0.605E-02	0.639E-02	-0.500E-02
6105.3 A	5000.	0.368E-01	-0.971E-02	0.819E-02	-0.697E-02	0.703E-02	-0.579E-02
C= 0.13D+19	10000.	0.375E-01	-0.546E-02	0.909E-02	-0.796E-02	0.776E-02	-0.663E-02
	20000.	0.365E-01	-0.162E-02	0.101E-01	-0.903E-02	0.860E-02	-0.754E-02
	30000.	0.359E-01	0.122E-03	0.108E-01	-0.972E-02	0.915E-02	-0.811E-02
	40000.	0.354E-01	0.674E-03	0.113E-01	-0.102E-01	0.956E-02	-0.854E-02
2P - 4D	2500.	0.256	-0.201E-01				
4604.2 A	5000.	0.242	-0.147E-01				
C= 0.14D+17	10000.	0.221	-0.109E-01				
	20000.	0.196	-0.607E-02				
	30000.	0.181	-0.336E-02	0.185*	0.196*		
	40000.	0.170	-0.192E-02	0.178*	0.214*		
2P - 5D	2500.	0.542	-0.161E-01				
4133.8 A	5000.	0.543	-0.136E-01				
C= 0.16D+17	10000.	0.512	-0.996E-02				
	20000.	0.462	-0.516E-02				
	30000.	0.429	-0.726E-02				
	40000.	0.406	0.336E-02				
2P - 6D	2500.	1.06	-0.147				
3916.5 A	5000.	1.10	-0.108				
C= 0.24D+16	10000.	1.05	-0.769E-01				
	20000.	0.948	-0.356E-01				
	30000.	0.882	-0.213E-01				
	40000.	0.834	-0.111E-01				
2P - 7D	2500.	1.68	-0.245				
3796.1 A	5000.	1.84	-0.191				
C= 0.17D+16	10000.	1.80	-0.116				
	20000.	1.67	-0.590E-01				
	30000.	1.56	-0.360E-01				
	40000.	1.48	-0.167E-01				
3S - 3P	2500.	0.811	0.412	0.206	0.158	0.181	0.130
26887.1 A	5000.	0.981	0.268	0.226	0.183	0.197	0.152
C= 0.26D+20	10000.	1.12	0.137	0.249	0.209	0.215	0.174
	20000.	1.19	0.317E-01	0.275	0.237	0.236	0.198
	30000.	1.22	-0.770E-02	0.292	0.255	0.250	0.213
	40000.	1.23	-0.201E-01	0.306	0.269	0.261	0.225

PERTURBER DENSITY= 0.1D+16

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
3S - 4P	2500.	0.614	0.381	0.155*	0.114*	0.133*	0.914E-01*
10795.1 A	5000.	0.654	0.288	0.172*	0.138*	0.147*	0.113*
C= 0.18D+19	10000.	0.704	0.193	0.192	0.162	0.163*	0.134*
	20000.	0.708	0.133	0.214	0.187	0.181*	0.155*
	30000.	0.706	0.722E-01	0.228	0.202	0.193	0.168
	40000.	0.701	0.532E-01	0.239	0.213	0.202	0.178
3S - 5P	2500.	1.12	0.647				
8467.8 A	5000.	1.19	0.505				
C= 0.57D+18	10000.	1.25	0.350	0.355*	0.286*		
	20000.	1.23	0.224	0.397*	0.338*		
	30000.	1.21	0.956E-01	0.425*	0.369*	0.357*	0.305*
	40000.	1.19	0.830E-01	0.446*	0.391*	0.374*	0.325*
3S - 6P	2500.	2.10	1.05				
7584.5 A	5000.	2.26	0.843				
C= 0.27D+18	10000.	2.32	0.658				
	20000.	2.26	0.377				
	30000.	2.21	0.280				
	40000.	2.17	0.124				
3S - 7P	2500.	3.73	1.54				
7137.1 A	5000.	4.05	1.29				
C= 0.15D+18	10000.	4.11	1.01				
	20000.	4.00	0.589				
	30000.	3.90	0.435				
	40000.	3.80	0.262				
3P - 4S	2500.	1.09	0.295	0.109	0.611E-01	0.103	0.507E-01
24469.7 A	5000.	1.43	0.447	0.114	0.700E-01	0.107	0.583E-01
C= 0.21D+20	10000.	1.66	0.585	0.120	0.797E-01	0.111	0.665E-01
	20000.	1.81	0.640	0.126	0.903E-01	0.117	0.754E-01
	30000.	1.86	0.599	0.130	0.975E-01	0.120	0.811E-01
	40000.	1.90	0.554	0.131	0.103	0.123	0.852E-01
3P - 5S	2500.	0.872	0.523	0.158	0.126	0.133*	0.102*
13560.9 A	5000.	1.03	0.638	0.177	0.151	0.149*	0.124*
C= 0.66D+19	10000.	1.12	0.651	0.198	0.175	0.167	0.145
	20000.	1.20	0.623	0.222	0.201	0.187	0.168
	30000.	1.24	0.550	0.237	0.217	0.199	0.181
	40000.	1.29	0.489	0.249	0.229	0.209	0.191
3P - 6S	2500.	1.35	0.906	0.269*	0.195*		
11034.8 A	5000.	1.51	1.06	0.302*	0.244*	0.254*	0.197*
C= 0.44D+19	10000.	1.60	1.02	0.339*	0.291*	0.285*	0.239*
	20000.	1.68	0.885	0.381*	0.339*	0.319*	0.281*
	30000.	1.78	0.732	0.408*	0.368*	0.342*	0.306*
	40000.	1.87	0.629	0.428	0.390	0.358*	0.324*
3P - 7S	2500.	2.25	1.50				
9957.7 A	5000.	2.42	1.73				
C= 0.25D+19	10000.	2.63	1.70				
	20000.	2.73	1.20	0.656*	0.568*		
	30000.	2.93	0.975	0.702*	0.621*		
	40000.	3.06	0.866	0.736*	0.659*		

PERTURBER DENSITY= 0.1D+16

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
3P - 8S	2500.	3.72	2.52				
9379.3 A	5000.	3.92	2.76				
C= 0.14D+19	10000.	4.15	2.54				
	20000.	4.53	1.66				
	30000.	4.87	1.37				
	40000.	5.09	1.23				
3P - 4D	2500.	4.05	-0.493				
17550.0 A	5000.	3.83	-0.389				
C= 0.21D+18	10000.	3.56	-0.300				
	20000.	3.19	-0.175				
	30000.	2.96	-0.118	2.66*	2.82*		
	40000.	2.81	-0.826E-01	2.52*	3.08*		
3P - 5D	2500.	4.89	-0.230				
12240.6 A	5000.	4.89	-0.191				
C= 0.14D+18	10000.	4.65	-0.140				
	20000.	4.21	-0.787E-01				
	30000.	3.92	-0.257E-01				
	40000.	3.71	0.133E-02				
3P - 6D	2500.	7.75	-1.12				
10513.1 A	5000.	8.01	-0.848				
C= 0.17D+17	10000.	7.65	-0.559				
	20000.	6.94	-0.272				
	30000.	6.47	-0.148				
	40000.	6.12	-0.837E-01				
3P - 7D	2500.	11.0	-1.63				
9688.9 A	5000.	12.1	-1.34				
C= 0.11D+17	10000.	11.8	-0.892				
	20000.	11.0	-0.410				
	30000.	10.3	-0.232				
	40000.	9.76	-0.143				
3D - 4P	2500.	2.28	1.33	0.510*	0.378*	0.435*	0.303*
19281.0 A	5000.	2.37	1.13	0.568*	0.459*	0.483*	0.375*
C= 0.57D+19	10000.	2.49	0.860	0.634	0.540	0.537*	0.446*
	20000.	2.47	0.571	0.708	0.623	0.598*	0.517*
	30000.	2.42	0.438	0.757	0.674	0.638	0.561
	40000.	2.38	0.278	0.794	0.712	0.668	0.593
3D - 5P	2500.	2.76	1.59				
12932.5 A	5000.	2.91	1.27				
C= 0.13D+19	10000.	3.03	0.963	0.833*	0.674*		
	20000.	2.96	0.583	0.932*	0.795*		
	30000.	2.90	0.449	0.997*	0.868*	0.838*	0.719*
	40000.	2.84	0.330	1.05*	0.920*	0.878*	0.764*
3D - 6P	2500.	4.49	2.26				
10979.7 A	5000.	4.82	1.82				
C= 0.56D+18	10000.	4.95	1.48				
	20000.	4.81	0.824				
	30000.	4.69	0.625				
	40000.	4.59	0.479				

PERTURBER DENSITY= 0.1D+16

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
3D - 7P	2500.	7.48	3.09				
10066.2 A	5000.	8.13	2.60				
C= 0.30D+18	10000.	8.24	2.08				
	20000.	8.01	1.23				
	30000.	7.80	0.895				
	40000.	7.60	0.662				
4S - 5P	2500.	9.73	4.96				
24978.1 A	5000.	10.7	3.49				
C= 0.50D+19	10000.	11.4	2.43	3.04*	2.46*		
	20000.	11.4	0.979	3.41*	2.90*		
	30000.	11.3	0.448	3.64*	3.16*	3.07*	2.62*
	40000.	11.2	0.145	3.83*	3.35*	3.21*	2.78*
4S - 6P	2500.	12.6	5.80				
18591.6 A	5000.	13.7	3.16				
C= 0.16D+19	10000.	14.2	2.85				
	20000.	13.9	0.928				
	30000.	13.7	0.642				
	40000.	13.5	0.438				

PERTURBER DENSITY= 0.1D+17

2S - 2P	2500.	0.230E-01	-0.584E-02	0.112E-01	-0.160E-02	0.112E-01	-0.133E-02
6709.6 A	5000.	0.234E-01	-0.689E-02	0.113E-01	-0.182E-02	0.112E-01	-0.152E-02
C= 0.55D+20	10000.	0.254E-01	-0.755E-02	0.113E-01	-0.206E-02	0.113E-01	-0.172E-02
	20000.	0.319E-01	-0.745E-02	0.113E-01	-0.232E-02	0.113E-01	-0.194E-02
	30000.	0.378E-01	-0.646E-02	0.113E-01	-0.248E-02	0.113E-01	-0.208E-02
	40000.	0.428E-01	-0.581E-02	0.113E-01	-0.261E-02	0.113E-01	-0.218E-02
2S - 3P	2500.	0.122	0.794E-01	0.320E-01*	0.202E-01*	0.277E-01*	0.158E-01*
3233.6 A	5000.	0.130	0.704E-01	0.354E-01*	0.257E-01*	0.306E-01*	0.207E-01*
C= 0.37D+18	10000.	0.140	0.567E-01	0.392E-01	0.309E-01	0.337E-01*	0.253E-01*
	20000.	0.142	0.447E-01	0.434E-01	0.362E-01	0.372E-01*	0.299E-01*
	30000.	0.142	0.359E-01	0.462E-01	0.394E-01	0.394E-01	0.327E-01
	40000.	0.141	0.297E-01	0.484E-01	0.417E-01	0.411E-01	0.347E-01
2S - 4P	2500.	0.396	0.219				
2742.0 A	5000.	0.418	0.189				
C= 0.12D+18	10000.	0.443	0.156				
	20000.	0.441	0.122				
	30000.	0.434	0.922E-01				
	40000.	0.428	0.735E-01	0.156*	0.130*		
2S - 5P	2500.	0.963	0.430				
2563.1 A	5000.	1.05	0.361				
C= 0.52D+17	10000.	1.11	0.322				
	20000.	1.09	0.243				
	30000.	1.07	0.177				
	40000.	1.05	0.133				
2S - 6P	2500.	1.75*	0.584*				
2475.8 A	5000.	2.07	0.534				
C= 0.28D+17	10000.	2.24	0.490				
	20000.	2.23	0.359				
	30000.	2.21	0.281				
	40000.	2.17	0.215				

PERTURBER DENSITY= 0.1D+17

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
2S - 7P	2500.	2.38*	0.565*				
2426.2 A	5000.	3.39*	0.633*				
C= 0.17D+17	10000.	3.84	0.614				
	20000.	3.98	0.458				
	30000.	3.97	0.376				
	40000.	3.93	0.280				
2P - 3S	2500.	0.222	0.159	0.520E-01	0.408E-01	0.443E-01	0.332E-01
8128.7 A	5000.	0.261	0.194	0.579E-01	0.485E-01	0.492E-01	0.399E-01
C= 0.25D+20	10000.	0.293	0.218	0.646E-01	0.564E-01	0.547E-01	0.467E-01
	20000.	0.312	0.224	0.722E-01	0.646E-01	0.610E-01	0.538E-01
	30000.	0.329	0.225	0.770E-01	0.697E-01	0.650E-01	0.581E-01
	40000.	0.334	0.206	0.807E-01	0.735E-01	0.681E-01	0.614E-01
2P - 4S	2500.	0.355	0.249	0.801E-01*	0.543E-01*	0.670E-01*	0.420E-01*
4973.1 A	5000.	0.418	0.304	0.900E-01*	0.699E-01*	0.755E-01*	0.561E-01*
C= 0.36D+19	10000.	0.455	0.349	0.101*	0.848E-01*	0.847E-01*	0.693E-01*
	20000.	0.475	0.350	0.113	0.997E-01	0.951E-01*	0.823E-01*
	30000.	0.482	0.322	0.121	0.109	0.102*	0.900E-01*
	40000.	0.493	0.298	0.127	0.115	0.107	0.955E-01
2P - 5S	2500.	0.796	0.516				
4274.3 A	5000.	0.905	0.634				
C= 0.13D+19	10000.	0.947	0.689				
	20000.	0.992	0.676	0.246*	0.204*		
	30000.	1.02	0.577	0.263*	0.226*		
	40000.	1.07	0.540	0.276*	0.241*	0.231*	0.199*
2P - 6S	2500.	1.71*	1.02*				
3986.7 A	5000.	1.91	1.30				
C= 0.64D+18	10000.	2.09	1.37				
	20000.	2.02	1.17				
	30000.	2.15	0.984				
	40000.	2.25	0.840				
2P - 7S	2500.	3.26*	1.74*				
3836.7 A	5000.	3.50*	2.25*				
C= 0.37D+18	10000.	3.79	2.39				
	20000.	3.95	1.89				
	30000.	4.18	1.56				
	40000.	4.36	1.25				
2P - 8S	2500.						
3747.7 A	5000.	6.48*	3.54*				
C= 0.23D+18	10000.	6.48	3.70				
	20000.	7.04	2.85				
	30000.	7.76	2.35				
	40000.	7.96	1.95				
					*		* *
2P - 3D	2500.	0.339	-0.136	0.737E-01	-0.510E-01*	0.634E-01	-0.405E-01*
6105.3 A	5000.	0.368	-0.913E-01	0.818E-01	-0.630E-01	0.701E-01	-0.512E-01*
C= 0.13D+19	10000.	0.375	-0.521E-01	0.908E-01	-0.748E-01	0.776E-01	-0.616E-01
	20000.	0.365	-0.158E-01	0.101	-0.869E-01	0.860E-01	-0.720E-01
	30000.	0.359	0.157E-02	0.108	-0.942E-01	0.914E-01	-0.783E-01
	40000.	0.354	0.705E-02	0.113	-0.995E-01	0.955E-01	-0.829E-01

PERTURBER DENSITY= 0.1D+17

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
2P - 4D	2500.	1.76	-0.294				
4604.2 A	5000.	1.85	-0.212				
C= 0.14D+17	10000.	1.81	-0.153				
	20000.	1.67	-0.846E-01				
	30000.	1.57	-0.532E-01				
	40000.	1.50	-0.361E-01				
2P - 5D	2500.	3.25	-0.429				
4133.8 A	5000.	3.90	-0.325				
C= 0.16D+17	10000.	4.03	-0.236				
	20000.	3.85	-0.121				
	30000.	3.67	-0.726E-01				
	40000.	3.52	-0.154E-01				
2P - 6D	2500.	4.76	-0.840				
3916.5 A	5000.	6.47	-0.671				
C= 0.24D+16	10000.	7.21	-0.533				
	20000.	7.18	-0.361				
	30000.	6.95	-0.216				
	40000.	6.72	-0.114				
2P - 7D	2500.	6.85*	-0.869*				
3796.1 A	5000.	9.32	-0.799				
C= 0.17D+16	10000.	11.3	-0.646				
	20000.	11.9	-0.414				
	30000.	11.7	-0.305				
	40000.	11.4	-0.167				
3S - 3P	2500.	8.11	3.84	2.04*	1.28*	1.78*	1.01*
26887.1 A	5000.	9.81	2.50	2.25*	1.62*	1.96*	1.31*
C= 0.26D+20	10000.	11.2	1.35	2.49	1.94	2.15*	1.59*
	20000.	11.9	0.302	2.75	2.27	2.36*	1.88*
	30000.	12.2	-0.879E-01	2.92	2.47	2.50	2.05
	40000.	12.3	-0.211	3.06	2.61	2.61	2.17
3S - 4P	2500.	6.10	3.25				
10795.1 A	5000.	6.51	2.55				
C= 0.18D+19	10000.	7.02	1.79				
	20000.	7.07	1.23				
	30000.	7.05	0.702				
	40000.	7.00	0.515	2.39*	2.00*		
3S - 5P	2500.	10.5	4.56				
8467.8 A	5000.	11.4	3.73				
C= 0.57D+18	10000.	12.1	3.01				
	20000.	12.0	1.91				
	30000.	11.9	0.892				
	40000.	11.7	0.778				
3P - 4S	2500.	10.8	2.88	1.08	0.537	1.01*	0.432*
24469.7 A	5000.	14.3	4.42	1.14	0.648	1.06*	0.531*
C= 0.21D+20	10000.	16.6	5.82	1.20	0.759	1.11	0.627
	20000.	18.1	6.40	1.26	0.875	1.17	0.727
	30000.	18.6	5.99	1.30	0.952	1.20	0.788
	40000.	19.0	5.54	1.31	1.01	1.23	0.832

PERTURBER DENSITY= 0.1D+17

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
3P - 5S	2500.	8.72	4.77				
13560.9 A	5000.	10.3	6.05				
C= 0.66D+19	10000.	11.2	6.31	1.98*	1.52*		
	20000.	12.0	6.17	2.22*	1.85*		
	30000.	12.4	5.46	2.37*	2.04*	1.99*	1.68*
	40000.	12.9	4.88	2.49*	2.18*	2.09*	1.80*
3P - 6S	2500.	13.5	7.75				
11034.8 A	5000.	15.1	9.68				
C= 0.44D+19	10000.	16.0	9.63				
	20000.	16.8	8.63				
	30000.	17.8	7.21				
	40000.	18.7	6.26				

PERTURBER DENSITY= 0.1D+18

TRANSITION	T(K)	ELECTRONS WIDTH(A)	SHIFT(A)	PROTONS WIDTH(A)	SHIFT(A)	IONIZED HELIUM WIDTH(A)	SHIFT(A)
2S - 2P	2500.	0.230	-0.574E-01	0.110	-0.149E-01	0.107	-0.122E-01
6709.6 A	5000.	0.234	-0.683E-01	0.112	-0.174E-01	0.111	-0.144E-01
C= 0.55D+20	10000.	0.254	-0.751E-01	0.113	-0.200E-01	0.112	-0.166E-01
	20000.	0.319	-0.744E-01	0.113	-0.228E-01	0.113	-0.190E-01
	30000.	0.378	-0.646E-01	0.113	-0.245E-01	0.113	-0.205E-01
	40000.	0.428	-0.580E-01	0.113	-0.258E-01	0.113	-0.216E-01
2S - 3P	2500.	1.19	0.623				
3233.6 A	5000.	1.28	0.583				
C= 0.37D+18	10000.	1.38	0.483				
	20000.	1.41	0.396				
	30000.	1.41	0.335				
	40000.	1.41	0.280	0.483*	0.378*		
2S - 4P	2500.	3.06	1.09				
2742.0 A	5000.	3.57	1.11				
C= 0.12D+18	10000.	4.00	0.995				
	20000.	4.10	0.859				
	30000.	4.09	0.740				
	40000.	4.06	0.593				
2S - 5P	2500.	3.89*	1.20*				
2563.1 A	5000.	6.25*	1.21*				
C= 0.52D+17	10000.	8.17	1.47				
	20000.	8.87	1.22				
	30000.	9.06	1.09				
	40000.	9.10	0.807				
2P - 3S	2500.	2.22	1.45	0.509*	0.268*	0.425*	0.191*
8128.7 A	5000.	2.61	1.84	0.577*	0.386*	0.488*	0.300*
C= 0.25D+20	10000.	2.93	2.11	0.645*	0.494*	0.546*	0.397*
	20000.	3.12	2.19	0.721	0.597	0.610*	0.488*
	30000.	3.29	2.23	0.770	0.657	0.650*	0.541*
	40000.	3.33	2.04	0.807	0.700	0.680	0.578
2P - 4S	2500.	3.54	2.02				
4973.1 A	5000.	4.18	2.71				
C= 0.36D+19	10000.	4.55	3.25				
	20000.	4.75	3.36				
	30000.	4.82	3.12				
	40000.	4.92	2.93				

TRANSITION	T(K)	ELECTRONS WIDTH(A)	ELECTRONS SHIFT(A)	PROTONS WIDTH(A)	PROTONS SHIFT(A)	IONIZED HELIUM WIDTH(A)	IONIZED HELIUM SHIFT(A)
PERTURBER DENSITY= 0.1D+18							
2P - 5S	2500.	7.84*	3.37*				
4274.3 A	5000.	9.02*	5.07*				
C= 0.13D+19	10000.	9.45	6.00				
	20000.	9.91	6.21				
	30000.	10.2	5.37				
	40000.	10.7	5.18				
2P - 3D	2500.	3.30	-1.03				
6105.3 A	5000.	3.63	-0.672				
C= 0.13D+19	10000.	3.72	-0.355				
	20000.	3.63	-0.680E-01	1.01*	-0.762*		
	30000.	3.57	0.560E-01	1.08*	-0.855*	0.913*	-0.696*
	40000.	3.52	0.803E-01	1.13*	-0.920*	0.955*	-0.753*
2P - 4D	2500.	8.10	-1.61				
4604.2 A	5000.	11.1	-1.19				
C= 0.14D+17	10000.	12.8	-0.870				
	20000.	12.9	-0.390				
	30000.	12.7	-0.237				
	40000.	12.4	-0.216				
PERTURBER DENSITY= 0.1D+19							
2S - 2P	2500.	2.29	-0.538	0.829*	-0.114*	0.665*	-0.871E-01*
6709.6 A	5000.	2.33	-0.664	1.02*	-0.149*	0.943*	-0.119*
C= 0.55D+20	10000.	2.54	-0.741	1.09*	-0.182*	1.06*	-0.149*
	20000.	3.19	-0.743	1.12	-0.215	1.10*	-0.178*
	30000.	3.78	-0.645	1.13	-0.235	1.12*	-0.195*
	40000.	4.28	-0.579	1.13	-0.249	1.12*	-0.207*
2S - 3P	2500.	6.88*	2.09*				
3233.6 A	5000.	9.44	2.78				
C= 0.37D+18	10000.	11.4	2.65				
	20000.	12.4	2.58				
	30000.	12.7	2.11				
	40000.	12.8	2.12				

al (1977) are in better agreement with the calculations of Benett and Griem (1971). A large difference exists also for the widths as well as for the shifts in the case of 2p–4d and 2p–5d multiplets. These transitions are strongly influenced by Debye screening effect. For example if we scale linearly to N = 10^{16} cm^{-3} the results obtained for N = 10^{14} cm^{-3}, we will obtain for the width 2.4 Å instead of 1.81 Å, in the case of 2p–4d multiplet. In the case of 2p–5d multiplet the width will be 5.5 Å instead of 4.0 Å and the shift +0.075 Å instead of –0.24 Å. In the calculations of Benett and Griem (1971), the Debye screening effect was not taken into account.

In Figs 1 and 2, the electron–impact full halfwidths and shifts for 2s–np spectral series are presented as a function of the principal quantum number of the upper level (n_i), for T = 2,500 K and 40,000 K. One can see the systematic increase of the Stark broadening parameters with the increase of n_i as expected. The inspection of energy separation between the upper level and the principal perturbing levels for the 2s–np series (see the Grotrian diagrams in Bashkin and Stoner, 1985), shows that this value decreases gradually within the spectral series what explains the gradual increase of Stark broadening parameters. The shift for the 2s–2p multiplet is negative due to the larger negative contribution of the lower level. For other members of the series the shift becomes positive since the positive, upper level contribution increases.

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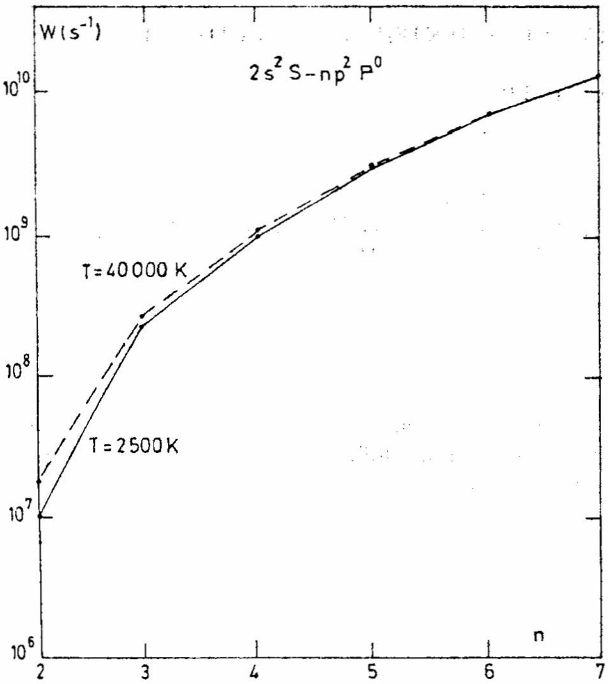

Fig. 1. Electron-impact full halfwidths for Li(I) $2s^2S - np^2P^0$ lines as a function of n_i for T = 2,500 and 40,000 K at $N_e = 10^{13}$ cm^{-3}

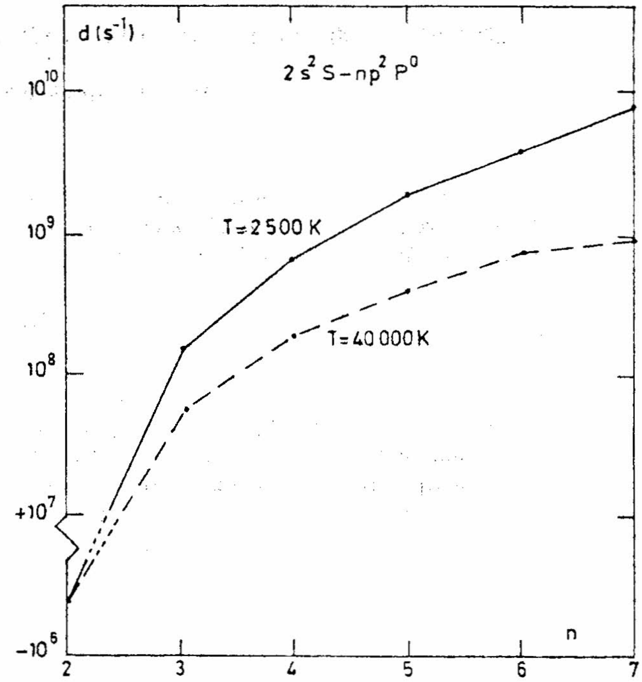

Fig. 2. As in Fig. 1 but for the electron-impact shift.

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ШТАРКОВО ШИРЕЊЕ ЛИНИЈА Li(I) СУДАРИМА СА НАЕЛЕКТРИСАНИМ ЧЕСТИЦАМА

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УДК 52–355.3

Оригинални научни рад

Користећи семикласични прилаз, израчунате су ширине и помаци спектралних линија проузроковани сударима са електронима, протонима и јонизованим хелијумом, за 54 мултиплета неутралног литијума. Резултати су дати у функцији температуре (T = 2,500 – –40,000 K) и концентрације пертурбера (10^{14}–10^{18} cm^{-3}). На основу добијених резултата истраживане су регуларности параметара ширења у оквиру спектралних серија.

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ANALYSIS OF THE EQUIPOTENTIAL SURFACES OF CORONAE OF SPIRAL GALAXIES*

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SUMMARY: Assuming a spheroidal corona with an analogous density function as in Ninković, 1988, the author analyses the resulting equipotential surfaces. They are found to be spheroids. The obtained results are applied to our Galaxy by estimating the distance to the galactic plane above (below) the Sun where the potential is one half of that at the Sun. This distance is found to be equal a few tens of kpc. Therefore, at the present level of information one cannot reject the possibility that the galactic corona is flattened significantly.

1. INTRODUCTION

In a number of papers it has been suggested that spiral galaxies are surrounded by dark massive coronae (e. g. Trimble, 1987). One of the problems in this field of research is the actual shape of these coronae. Are they almost perfectly round, or substantially flattened? Various approaches are possible (e. g. Binney et al., 1987). The main difficulty is that at present there is no sufficiently reliable observational evidence. One useful direction may be that proposed by Monet et al. (1981) based on examinations of the motions of Population II objects. However, because of a too simple assumption concerning these motions, their conclusion seems rather doubtful. The task of the present paper is to examine the problem by using in principle the same approach as Monet et al. (1981), but avoiding the limitations to the motion of halo (region of Population II objects) objects assumed by them.

2. PROCEDURE

Since the concept of coronae in spiral galaxies has been introduced in order to explain the rotation curves, it is assumed that the form of the density function within a corona is that resulting in a sufficiently flat rotation curve. This requirement is satisfied by assuming for instance the same density function as in an earlier paper (Ninković, 1988). This time the given density function is generalised so that instead of the distance to the centre of a galaxy a new argument q

$$q = (R^2 + (z/\epsilon)^2)^{1/2},$$

where R is the distance to the rotation axis, $|z|$ is the distance to the plane of symmetry and ϵ is the axial ratio ($0 \leqslant \epsilon \leqslant 1$), is introduced. When $\epsilon = 1$, as easy to see, q becomes equal to the galactocentric distance. As it was done by Monet et al. (1981) the equipotential surfaces will be examined. The three authors found the relation between the equipotential surfaces of the corona (being the main contributor to the potential of a spiral galaxy) and the equidensit surfaces of the halo by assuming an isothermal and isotropic velocity distribution for its objects. However, taking into account the available data on the halo of our own Galaxy (e. g. Freeman, 1987) it is easy to see that the velocity distribution is quite anisotropic and not isothermal over the entire radius. On the other hand, on the basis of theo-

* Dedicated to the memory of Dr. G. Teleki.

retical considerations it is difficult to expect an isothermal and isotropic velocity distribution within systems as rarefied as halos of spiral galaxies. Therefore, assuming an isothermal and isotropic velocity distribution within halos of spiral galaxies seems to be incorrect. In such a case it remains to find the potential from the assumed density distribution and to analyse the resulting equipotential surfaces.

The potential function is calculated numerically by using the general formulae given by Schmidt (1956). In this way the potential is obtained at various points of space. By using the least–square method it is established that the points of equal potential lie along spheroids. The axial ratio of these equipotential spheroids is different from the axial ratio of the corresponding equidensit surfaces and is not constant. In the centre of the system (corona) the relationship between the axial ratio of the equidensit surfaces and the equipotential ones is the same as in the case of a homogeneous spheroid: for example if ϵ (axial ratio of equidensit) = 0.9, ϵ_p (axial ratio of equipotential) = 0.94, ϵ = 0.8, ϵ_p = 0.88 and so on. ϵ_p gradually increases outwards reaching one in the infinity. The increase is the direct consequence of the inhomogeneity of the coronal spheroid; if the spheroid were homogeneous, the axial ratio of its equipotential surfaces would be constant inside the spheroid. The rate of the increase depends on the ratio of the characteristic parameter to the semimajor axis (r_c/r_l ratio in Ninkovic, 1988, herein q_c/a ratio). As this ratio is smaller, the faster is the increase in the axial ratio of the equipotential surfaces and vice versa.

3. DISCUSSION AND CONCLUSIONS

At first one should say that the relationship between the equipotential surfaces of the corona and the equidensit ones of the halo can be found by means of the hydrodynamical equations. It is not simple unless the velocity distribution of halo objects is isothermal and isotropic. Thus, in principle motions of halo objects forming a sufficiently round space structure can take place also in the potential field produced by a flattened structure.

The equipotential surfaces of the corona studied above can be used for the purpose of calculating the ratio of the potential at an arbitrary point in the plane of symmetry to the potential at a point above (below) it. This is important because of the fact that, for example, in our own Galaxy examinations of the variation in the escape velocity (potential) for the solar distance to the rotation axis at various distances to the galactic plane can provide a valuable information concerning the flattening of the galactic corona. Bearing in mind the existing literature (e. g. Caldwell and Ostriker, 1981; Rohlfs and Kreitschmann, 1981) the present results may be applied to this case by assuming the value of 0.1 for both the ratio of the characteristic parameter to the semimajor axis and the ratio of the solar distance from the axis of rotation to the semimajor axis. Thus the potential of the corona at R = 0.1 a (a–semimajor axis of corona) becomes twice as small as at z=0 at $|z|$ = 0.58 a for ϵ = 1, at $|z|$ = 0.52 a (ϵ = 0.8), $|z|$ = 0.38 a (ϵ = 0.4) and so on. In the extreme case ϵ = 0 this takes place at $|z|$ = 0.234 a. Converting these values into kpc and assuming $R_\odot$ = 8.5 kpc, one concludes that the potential of the galactic corona (and practically potential of the Galaxy) reaches one half of its value at the Sun at distances to the galactic plane (for same R) of a few tens of kpc. Though the existing data indicate a nearly constant velocity dispersion for the halo objects of our Galaxy up to almost 25 kpc from the galactic plane (Freeman, 1987), it is difficult to establish how far from the plane at $R = R_\odot$ the galactic potential becomes one half of its value at the Sun. Therefore, the possibility of a significant flattening of the galactic corona cannot be rejected at the present level of information. Perhaps, a method applying the tensor virial theorem may throw more light on the problem.

NOTE

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АНАЛИЗА ЕКВИПОТЕНЦИЈАЛНИХ ПОВРШИ КОРОНА СПИРАЛНИХ ГАЛАКСИЈА

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УДК 524.7
Оригинални научни рад

Усвајајући сфероидну корону са аналогном функцијом густине као у раду Нинковић, 1988, аутор анализира резултујуће еквипотенцијалне површи. Оне су сфероидног облика. Добијени резултати се примењују на нашу Галаксију тако што се процењује удаљеност од галактичке равни изнад (испод) Сунца где потенцијал достиже половину вредности коју има на положају Сунца. Нађено је да та удаљеност износи неколико десетина кпс. Дакле, могућност да је корона наше Галаксије знатно спљоштена не може да се одбаци на садашњем нивоу информисаности.

Bull. Obs. Astron. Belgrade N° 143 (1991), 53–58

UDC 524.3(083.8)–14
Review paper

OBSERVATIONAL WORK PERFORMED WITH THE BELGRADE LARGE MERIDIAN CIRCLE DURING THE PERIOD 1968–1988*

S. Sadžakov, Z. Cvetković, M. Dačić

Astronomical Observatory, Beograd, Volgina 7, Yugoslavia

(Received: October 26, 1989)

SUMMARY: The work performed with the Belgrade Large Meridian Circle and the results obtained during the last twenty years are presented.

1. CATALOGUE OF THE DECLINATIONS OF THE LATITUDE PROGRAMME STARS (KŠZ), 1972, Publ. Obs. Astron. Beograd, No 17,1

Sadžakov N. Sofija and Šaletić P. Dušan

The Belgrade Catalogue of Latitude Stars (KŠZ) covers the celestial sphere between +13° and +90°. It contains 3957 stars with magnitude of 3.0 to 9.4. Every star was observed four times on the average, in the interval 1968 - 1971. The mean epoch of observations is 1969.46; on the basis of all observations, mean values and the root–mean–square error (rms–error below) of a single observation were deduced as follows

$$\epsilon_{CE} = \pm 0''.336, \ \epsilon_{CW} = \pm 0''.345$$

respectively, the rms–error of a single observation is

$$\epsilon = \pm 0''.34.$$

The rms–error in the determination of the declination:

$$\epsilon_\delta = \pm 0''.17.$$

The study was also made on the dependence of the rms–error on a single observation as the function of stelar magnitude.

Independently of this, the rms–error of a single observation was deduced on the basis of the observations of reference stars:

$$\epsilon_{CE} = \pm 0''.27 \text{ and } \epsilon_{CW} = \pm 0''.29$$
$$\epsilon = \pm 0''.28.$$

In order to obtain an idea on the residual systematic errors, several comparisons were made between the obtained quantities and values in ephemerides of reference stars.

The mean error of a difference for the area $\delta < +45°$ is $\pm 0''.20$ and $\pm 0''.21$ for the area $\delta > +45°$ (218 stars from FK4).

For 629 stars from N30, contained in this Catalogue, the rms–error of the difference is $\pm 0''.24$.

In the catalogue AGK3 there are 3767 stars from CLS Belgrade. We made the comparison and we obtained the folowing results. Declination differences were computed by zones, as well as the rms–error of difference KŠZ – AGK3 which is: $\pm 0''.28$.

The comparison KŠZ and AGK3R was carried out through the analysis of systematic effects of the type $\Delta\delta_o$, $\Delta\delta_\delta$, $\Delta\delta_\alpha$, $\Delta\delta_m$, $\Delta\delta_{sp}$ where the indices point out their character.

The values $\Delta\delta_o = -0''.02$, $\Delta\delta_\delta$ vary from $+0''.12$ to $-0''.09$ and the errors of determination for all zones are $\pm 0''.02$.

* This article is dedicated to the memory of Dr. Đorđe Teleki, our friend, professor and collegue.

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The values $\Delta\delta_\alpha$ vary from +0".14 to −0".07 in individual segments of the sky.

The effects of type $\Delta\delta_m$ do not exist or they are so small that they are negligible in this kind of work.

The analysis of $\Delta\delta_{sp}$ shows that the stars of different spectral types have different values.

The values $\Delta\delta_{sp}$ (Fig. 1) change the sign at $\delta =$ = +45°, approximately. The stars of the spectral type A have the positive sign, while stars of the spectral type K have the negative one. This phenomenon is noticeable also with other spectral types.

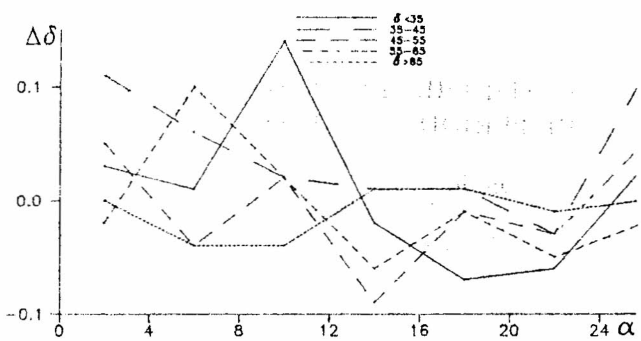

Fig. 1

By comparison of the position of stars of earlier and later types in relation to the position between the spectral types F and G, it is stated that the positions of the stars of earlier spectral types are shifted towards the zenith and those of the latter ones are shifted in the opposite direction.

Taking into consideration that in the calculation of the refraction the Pulkovo tables had been used, where the applied constant of refraction is k = 60".154, we obtained

k = 60".172 for the spectral type A
k = 60".159 for the spectral type F
k = 60".149 for the spectral type G
k = 60".141 for the spectral type K

2. CATALOGUE OF NPZT PROGRAMME STARS, 1981, Publ. Obs. Astron. Beograd, No 30, 1

Sadžakov S., Šaletić D., Dačić M.

The catalogue of the NPZT stars is obtained on the basis of the observational material compiled by use of the Meridian Circle of Belgrade Astronomical Observatory during 1973–1980. It contains 1638 stars with magnitudes $6.5 \leqslant m \leqslant 8.5$. The mean epoch of observations is 1977.02 in right ascension and 1976.78 in declination.

The rms–error of a single observation is $\epsilon_\alpha \cos\delta =$ = ±0^s.030, ϵ_δ = ±0".26.

The rms–error in the determination of the right ascension is $\epsilon_\alpha \cos\delta$ = ±0^s.012, and in the determination of the declination ϵ_δ = ±0".11.

Comparisons are made with FK4, the Catalogue of NPZT stars compiled in Bordeaux (BRD), Yasuda's catalogue NPZT (Y) and the PZTs at latitude stations (l.s).

335 FK4 stars were observed in right ascension and 346 FK4 stars in declination. The rms–error in right ascension is $\epsilon_\alpha \cos\delta$ = ±0^s.015 and ϵ_δ = ±0".14 in declination. The mean observational epoch is 1976.44 in right ascension and 1976.69 in declination.

3. BELGRADE CATALOGUE OF DOUBLE STARS, 1990, Publ. Obs. Astron. Beograd, No 38, 1

Sadžakov S., Dačić M.

In the period between March 1981 and April 1987 in Belgrade 1576 stars of the Double Stars Programme were observed. The double–stars programme partly composed in the fifties at Pulkovo under the supervision of M.S. Zverev was approved at the 14–th Astronomical Conference in 1958, to be proposed and accepted for observations at X IAU General Assembly in 1958.

The measurements and the treatment of the observational material were performed by use of the relative method. Both coordinates – right ascension (α) and declination (δ) were observed simultaneously, on the average every three minutes. There were such cases when the meridian transits of stars occured within a minute. We always observed the brighter component within a pair. If both components were equally bright, then the first one was observed.

The average number of observations per star were: 4.32 in right ascension, 4.43 in declination for programme stars and 5.2 in right ascension, 5.4 in declination for fundamental stars.

The positions of stars are given for equinoxes B1950.0 and J2000.0 and for the corresponding observational epoch.

The rms–error of a single observation of double stars between −30° to +60° is $\epsilon_\alpha \cos\delta$ = ±0^s.026, ϵ_δ = = ±0".34. The corresponding amounts for the fundamental stars are. $\epsilon_\alpha \cos\delta$ = ±0^s.022, ϵ_δ = ±0".32.

The single observation error in right ascension is the smallest about the zenith (0^s.023), whereas in declination (0".34) it is approximately equal in all observational zones. The mean observational epoch in the catalogue is 1983.90 in right ascension i. e. 1983. 84 in declination.

The proper motions are determined for 453 stars of this catalogue.

The average value of the $\sigma(\mu)$ error for these stars is ±0^s.00028, i. e. ±0".0036.

4. A CATALOGUE OF POSITIONS OF 290 STARS SITUATED IN THE VICINITY OF RADIO SOURCES, 1989, Astron. Journal, (in press)

Sadžakov S., Dačić M. and Cvetković Z.

Simultaneously with these observations we carried out between 1982 and 1987 observations of 290 stars from 78 parts of the sky situated in the vicinity of radio sources.

A programme star was observed on the average 5.5 in right ascension and 5.6 times in declination. The mean observational epoch of the catalogue is 1984.60 in right ascension and 1984.70 in declination. The positions of stars are given for the equinoxes B1950.0 and J2000.0 and for the corresponding observational epoch. The rms–error of a right ascension is $\epsilon_\alpha \cos\delta = \pm 0^s.024$ i. e. $\epsilon_\delta = \pm 0''.30$ for declination. The difference (CE–CW) obtained from the entire observational material is equal to $+0^s.007$ in right ascension i. e. $-0''.2$ in declination. The comparisons with both catalogues reveal the presence of systematic errors except in magnitude.

The corrections of the fundamental stars are derived from at least four and at most 40 measurements.

In both coordinates we observed 198 stars. The rms errors of a single position is $\epsilon_\alpha \cos\delta = \pm 0^s.009$ in right ascension, i. e. $\epsilon_\delta = \pm 0''.13$ in declination. The error of the weight unit is $\epsilon_\alpha \cos\delta = \pm\ 0^s.021$, i. e. $\epsilon_\delta = +0.30$. The mean observational epoch in right ascension is equal to 1984.60.

5. A CATALOGUE OF RIGHT ASCENSIONS AND DECLINATIONS OF FK4 STARS, 1989, Astron. Astroph. Suppl. Ser., No 77, 411

Sadžakov S. and Dačić m.

This catalogue contains the positions in right ascension and declination of 576 FK4 stars. The observations were carried out with the Meridian Circle at Belgrade Astronomical Observatory during the period 1981–1987. The average rms–error of a single observation (for the whole catalogue) is $\epsilon_\alpha \cos\delta = \pm 0^s.022$ and $\epsilon_\delta = \pm 0''.32$. The mean epoch of the catalogue is 1983.90 for right ascension and 1983.84 for declination.

6. GENERAL CATALOGUE OF LATITUDE STARS (IKŠZ), 1978, Publ. Obs. Astron. Beograd, No 24,1

Sadžakov S.

The values of declinations and proper motions in IKŠZ were derived on the basis of about 36000 star positions, the rms–errors of their determination ranging from $0''.20$ to $0''.62$, their average being $\pm 0''.35$. Sear positions used in the catalogues were determined from four measurements on the average, accordingly declinations and proper motions in the IKŠZ were determined from 36 measurements on the average. In this, as some kind of basic catalogue served the KŠZ, containing 3956 stars, with the mean epoch of observation 1969.44.

The rms–error of the determination of a single position in IKŠZ is $\epsilon_\delta = \pm 0''.06$, that of proper motion $\epsilon_\mu = \pm 0''.005$; mean epoch of observation is 1954.44 and the total number of stars in IKŠZ is 3895. All positions, as given in the catalogue, are referred to the equinox and epoch 1950.0.

7. DECLINATIONS AND THE PROPER MOTIONS OF THE STARS OF THE INTERNATIONAL LATITUDE SERVICE ON THE BASIS OF MERIDIAN CATALOGUES FROM 1929–1972 (BSKŠZ1; BSKŠZ2), 1975, Publ. Obs. Astron. Beograd, No 21,1

Sadžakov S., Šaletić D.

The declinations in this catalogue have been obtained with an internal accuracy $\epsilon_\delta = \pm 0''.023$ and the proper motions are characterized by error $\epsilon_\mu = \pm 0''.0023$. The mean epoch of the observations is 1954.0. The total number stars in BSKŠZ1 and BSKŠZ2 is 440.

8. INVESTIGATION OF THE SYSTEMATIC ERORS $\Delta\delta_\alpha$ IN THE LATITUDE OBSERVATIONS OF DIFFERENT OBSERVATORIES FROM THEIR COMPARISON WITH THE BELGRADE GENERAL CATALOGUE OF LATITUDE STARS (IKŠZ) AND WITH PHOTOGRAPHIC CATALOGUE AGK3, 1979, Publ. Obs. Astron. Beograd, No 27,1

Sadžakov S.

Short–period systematic differences of the $\Delta\delta_\alpha$ type in the AGK3 (in consequence of the narrowness of sky segments covered by individual plates) make obligatory and legitimate the efforts, currently being put into the working out of a single catalogue of the PZT stars. The diversity of methods being applied to this end is expected to contribute to the elimination of the false accordance, mentioned above.

The systematic differences originating from the errors in proper motions in both catalogues are practically the same. From their amount one can infer that the epochs of latitude series and the mean epochs of the catalogues should not differ by more then 10 to 20 years. The epoch differences exceeding this interval may have and excessive effect (mean error of the proper motions in declination $\epsilon = \pm 0''.012$).

The total systematic difference of the $\Delta\delta_\alpha$ type found for some latitude stations is very high (Greenwich 1). However, upon eliminating the constant part, the variable part behaves in accordance with the fundamental catalogue systems, accordingly, it directly affects the latitude determination.

The elimination of this error and the reprocessing of the latitude data will certainly furnish a different presentation of the polhody and thence, the value of the z–term.

The dependence of the z–term and the systematic errors $\Delta\delta_\alpha$ is also shown in the present statement. The best demonstration of this dependence is provided by the Pulkovo latitude system, which is practically exempt of both $\Delta\delta_\alpha$ and the z–term. We consider it necessary to point out that some of the methods of determination of this term, like those employed in the treatment of the ILS data, which almost fail to disclose its variation in time (probably in consequence of the smoothening being pushed to far) are not quite suitable to the research into this dependence. This dependence has, otherwise, been stated in all the data except those, where even the latitude services were unable to derive the z–term, perhaps on account of the residual errors of some other type (Blagovestchensk, Ulan Bator, Belgrade 1 and Belgrade 2).

Our attempt to find out a reliable criterion for the estimate of the external accuracy in the latitude determinations by way of the analysis of the corrections to the declinations of the common latitude stars, derived by chain method, failed to yield the expected results owing, on one hand, to the dependence of the corrections to declinations (Washington, Mizusawa) and on the other, to the existence, in the data of the stations observing the same stars (Irkutsk, Borowiec), of other systematic errors.

Our analysis, by establishing the existence of the systematic errors of the $\Delta\delta_\alpha$ type in the latitude observations, are in harmony with the results of many other authors, mentioned earlier. There, therefore, cannot be any doubt as to their existence. The catalogues of the kind the IKŠZ is, afford the possibility of rediscussing the latitude data within a unique system, wherewith further improvement of the results might follow.

By the present work the existence of only one error, significant by its amount, in the latitude observations is shown and assessed, other errors in the latitude programmes being only foreshadowed.

The nonuniform data handling, nonunified coordinate systems, varying number of stars, swift and frequent changes in the methods of processing, make the researches in this field difficult and to some extent even unreliable. We therefore recommend:

1. Coordinated and unified mode of handling the observations;

2. The star sellection for the latitude programmes is to be made from one and the same catalogue system (e. g. General Catalogue of Latitude Stars);

3. An evened number of stars (not below 200) and a unified observing procedure;

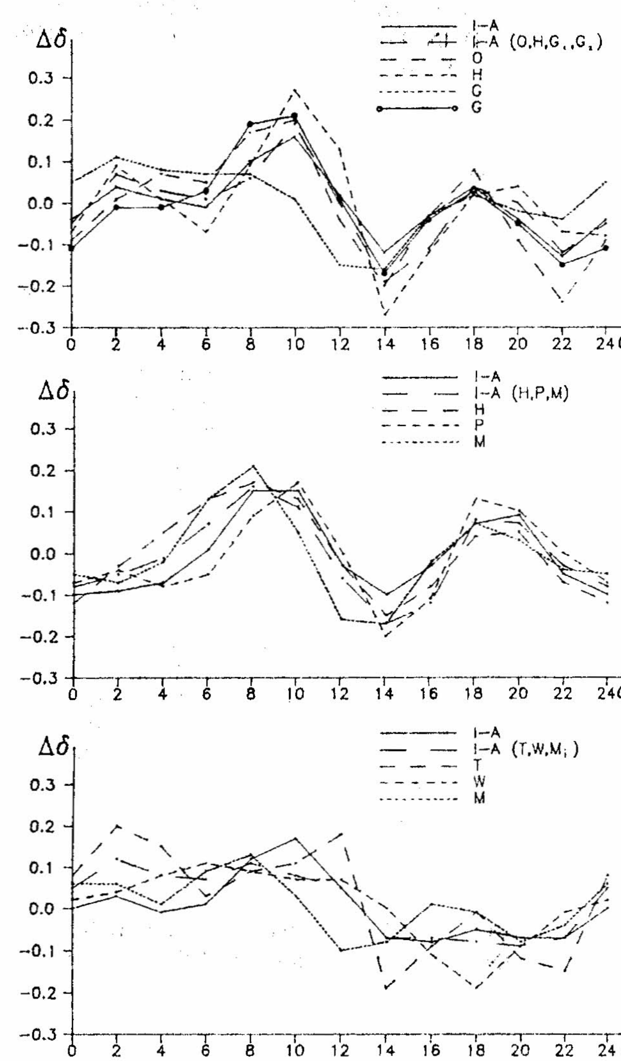

Fig. 2

4. The data thus collected and the treatment accordingly implemented, would surely contribute significantly to the improvement of the future fundamental system;

5. Having regard to the present status of the latitude catalogues of declinations, their inclusion into the material on the ground of which the improvement of the fundamental system is to be effected, will present, apart from rare instances, a very delicate problem.

The present paper, with its results, cannot, for the time being, aspire to some ultimate and categorical conclusions, yet it should be considered as the first successful attempt of the kind, which, though in the first approximation, furnishes a suffificiently convincing accuracy estimate of the results of latitude observations.

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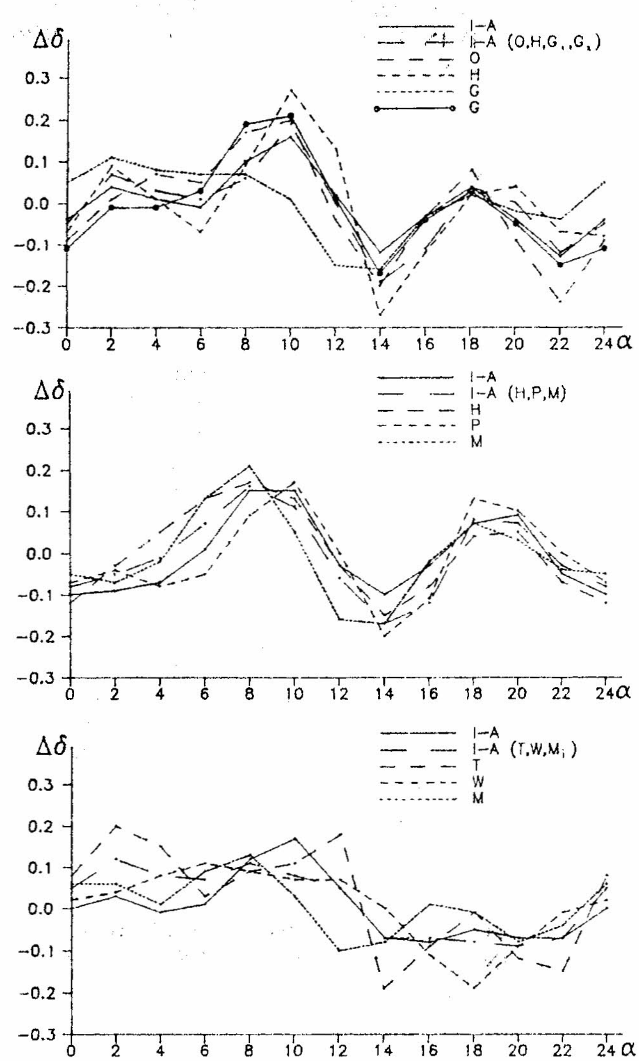

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9. OBSERVATIONS OF THE SUN AND INNER PLANETS WITH THE LARGE MERIDIAN CIRCLE IN BELGRADE, 1987, Coll. No 100, Beograd

Sadžakov S., Dačić M.

At the Belgrade Astronomical Observatory since January 1975 there have been regular observations of the Sun and inner planets. The observations are made according to corresponding instructions. During the observations of the Sun Sukharev's filter was used by 1985 and a new one from high quality glass afterwards.

The objects were observed with a hand driven micrometer by the differential method. The choice of reference stars was made according to the same criterion as aplied in the formation of the differential catalogues There were no alterations of the observational team: the distribution of observations was on the whole even and personal errors were determined as well. The mean duration of diurnal observations was four hours. During the summer a small number of FK4 stars was observed to a magnitude of 1.2 only, whilst possibilities were greater during the winter period (3.4 apparent magnitude). Because of this more Küstner's series were observed during the summer period (during the winter period two series corresponding to both positions of the circle were observed).

The observed apparent right ascensions and declinations of the Sun and the planets are compared to the ephemeris ones and they presented in Table 1.

The corrections of the orbital elements of the Sun and the errors (σ) of their determination, based on the observation in the period 1975–1988 presented in Table 2.

Table 1

Object	$(O-C)_\alpha$	ϵ_α	n1	$(O-C)_\delta$	ϵ_δ	n2
Sun	$-0^s.008$	$\pm0^s.006$	460	$-0''.03$	$\pm0''.02$	520
Mercury	+0.010	±0.014	147	−0.04	±0.06	151
Venus	−0.005	±0.004	403	−0.01	±0.03	458

The corrections of the orbital elements of Mercury and Venus and the errors (σ) of their determination, based on the observations in the period 1975–1988 presented in Table 3.

From the data of Tables 2 and 3 it is evident that the values of the corrections obtained coincide one with another within the limits of the errors in position determinations. Determination errors $\Delta\delta_0$ are approximately equal for the Sun and Venus and smaller than for Mercury. The latter fact can be explained by the unequal number of observations and also by the existence of a dependence on accuracy in the determination of zero point corrections to the mean distances of the planets.

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Publ. Obs. Astron Beograd, No 14.

Yasuda H., Kamijo I.: 1971, *Ann. Tokyo Astron. Observ.,* No **13**, 1.

Table 2

	ΔA	$\sigma_{\Delta A}$	$\Delta\epsilon$	$\sigma_{\Delta\epsilon}$	$\epsilon\Delta\pi$	$\sigma_{\epsilon\Delta\pi}$	n1	$\Delta\delta_0$	$\sigma_{\Delta\delta_0}$	$\Delta\epsilon$	$\sigma_{\Delta\epsilon}$	ΔLo	$\sigma_{\Delta Lo}$	n2
		in	0s001	unit					in	0".01	unit			
corrections	−1	±3	+22	±30	−6	±4	460	+3	±3	−1	±3	+12	±7	520

Table 3

	x1	σ_{x1}	y1	σ_{y1}	z1	σ_{z1}	n1	x2	σ_{x2}	y2	σ_{y2}	z2	σ_{z2}	n2
		in	$0^s.001$	unit					in	0".01	unit			
Mercury	−24	±10	−10	±15	+32	±12	147	−2	±4	−3	±8	−6	±7	151
Venus	− 6	± 5	− 1	± 2	+ 2	± 8	403	−4	±4	−10	±4	−5	±5	458

ПОСМАТРАЧКИ РАД ИЗВЕДЕН СА БЕОГРАДСКИМ ВЕЛИКИМ МЕРИДИЈАНСКИМ КРУГОМ У ПЕРИОДУ 1968 – 1988.

С. Саџаков, З. Цветковић, М. Дачић

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УДК 524.3 (083.8) – 14
Прегледни чланак

Даје се преглед већих радова урађених са Меридијанским кругом у Београду за последњих 20 година, као и анализа резултата добијених из посматрачко материјала сакупљеног са поменутим инструментом

Bull. Obs. Astron. Belgrade N^{O} 143 (1991), 59–61 UDC 521.864:523.46–87
Preliminary report

OCCULTATION OF 28 SGR BY TITAN ON 1989 JULY 3RD*

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(Received: November 20, 1990)

SUMMARY: This article presents the results of the photometric, photographic and visual recordings of the occultation of 28 Sgr by Titan, made by the authors at Belgrade Astronomical Observatory on July 3rd, 1989.

The observation of 28 Sgr occultation by Titan was made with the Belgrade Observatory polarimeter and 65 cm refractor. The signal is modulated by polarization analyser making one turn per minute resulting in a double sine–wave per minute. The three second lasted time marks were also recorded every minute. On the record within the occultation are also seen three longer interruptions made for guiding control. The original record is presented in the Figure 1.

The intensity data in the Table 1 were obtained by fitting a smooth curve through the curve of Figure 1 and digitalisting it in four – second intervals. Intensity is normalised to the value 1.000 corresponding to the mean intensity of the full signal of Titan and the star before and after the occultation. At the same time, the sky polarization, measured separately, has been removed. However, it is possible that the star or Titan signal contains some residual polarization. The

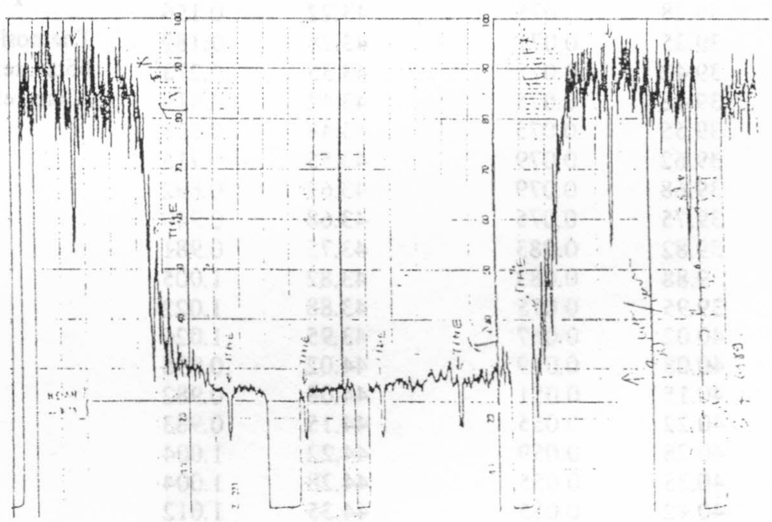

Fig. 1. Original record of 28 Sgr occultation by Titan on 1989 July 3rd made at Belgrade Observatory. Time increasis from right to left.

* Dedicated to the memory of Dr.G. Teleki.

Table 1

Occultation of 28 Sgr by Titan on 1989 July 3rd

Time [UT]	Intensity	Time [UT]	Intensity
$22^h37^m.08$	1.014	$22^h40^m.62$	0.044
37.15	1.010	40.82	0.032
37.22	1.010	40.88	0.044
37.28	1.011	40.95	0.059
37.35	1.007	41.02	0.059
37.42	1.004	41.08	0.044
37.48	1.004	41.15	0.036
37.55	0.993	41.22	0.036
37.62	0.989	41.28	0.036
37.68	0.992	41.35	0.036
37.75	0.996	41.42	0.046
37.82	1.002	41.48	0.040
37.88	0.999	42.02	0.040
37.95	0.995	42.08	0.032
38.02	0.996	42.15	0.032
38.08	0.921	42.22	0.032
38.15	0.875	42.28	0.036
38.22	0.531	42.35	0.044
38.28	0.438	42.42	0.036
38.35	0.305	42.48	0.036
38.42	0.203	42.55	0.036
38.48	0.149	42.62	0.032
38.55	0.125	42.68	0.036
38.82	0.102	42.75	0.052
38.88	0.098	42.82	0.080
38.95	0.106	42.88	0.108
39.02	0.098	42.95	0.120
39.08	0.082	43.02	0.128
39.15	0.075	43.08	0.120
39.22	0.071	43.15	0.136
39.28	0.075	43.22	0.156
39.35	0.071	43.28	0.189
39.42	0.075	43.35	0.273
39.48	0.075	43.42	0.419
39.55	0.075	43.48	0.538
39.62	0.079	43.55	0.715
39.68	0.079	43.62	0.892
39.75	0.075	43.68	0.949
39.82	0.083	43.75	0.981
39.88	0.083	43.82	1.005
39.95	0.075	43.88	1.022
40.02	0.067	43.95	1.026
40.08	0.059	44.02	0.998
40.15	0.051	44.08	0.982
40.22	0.055	44.15	0.983
40.28	0.059	44.22	1.004
40.35	0.055	44.28	1.004
40.42	0.055	44.35	1.012
40.48	0.051	44.48	0.984
40.55	0.051		

normalised intensity versus time is seen in the Figure 2. At the same time, photographical and visual observations of the phenomenon were carried out with the Askania 13cm refractor. Metcalf 10 min exposure method was used in the case of photographical recording. Visual timing of occultation (reapparition only) was registered by chronograph.

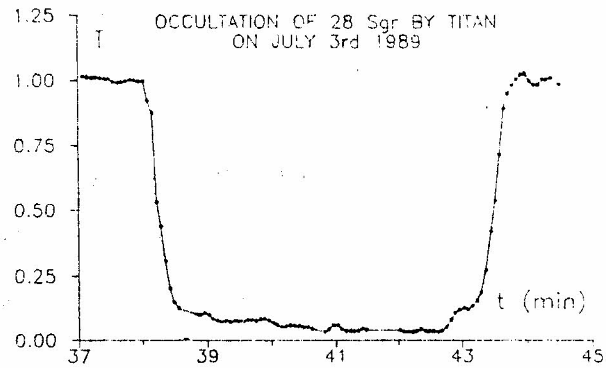

Fig. 2. Normalised intensity versus time taken from the Table 1.

The lenght of 28 Sgr trail is derived by the comparison with the lenghts of trails of three stars whose magnitudes and spectral types were similar to the occulted star.

On the basis of such plate measurements the next results are obtained:

T_1 (dispparition) = $22^h\ 38^m\ 41^s.6$ UTC

T_2 (reapparition) = 22 43 00.4 UTC

That means that the duration of the observed phenomenon was $258^s.8$. Visual timings is:

T (reapparition) = 22 43 04.9 UTC

The position of instruments are:

65cm refractor: $L = -1^h\ 22^m\ 03^s.31$ $\phi = +44°\ 48'\ 12''.4$

13cm refractor: $L = -1\ \ 22\ \ 03.09$ $\phi = +44\ \ 48\ \ 15.0$

h = 260 m.

АНАЛИЗА РЕЗУЛТАТА ПОСМАТРАЊА ОКУЛТАЦИЈЕ 28 Sgr ТИТАНОМ

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УДК 421.864:523.46–87

Претходно саопштење

У овом раду анализирани су резултати фотометријских, фотографских и визуалних посматрања окултације звезде 28 Sgr Сатурновим сателитом Титаном 3. јула 1989. године инструментима Астрономске опсерваторије у Београду.

Bull. Obs. Astron. Belgrade N° 143 (1991), 63–76

UDC 523.44

Preliminary report

294 PHOTOGRAPHIC POSITIONS OF MINOR PLANETS OBTAINED WITH THE GPO TELESCOPE OF ESO – LA SILLA IN 1987*

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SUMMARY: 294 precise photographic positions of minor planets observed with the GPO telescope (f = 4m, d=40 cm) of the European Southern Observatory (ESO), La Silla, Chile, during February–March 1987 are presented. *Five new asteroids* **were discovered during this mission.**

INTRODUCTION

Here we present the results of photographic observations of minor planets which were carried out in February and March 1987 with the Grand Prism Objective at the European Southern Observatory, La Silla, Chile, by H. Debehogne.

294 precise positions are obtained. Five new minor planets were discovered: 1987 DL_6, 1987 DM_6, 1987 DF_6, 1987 EP and 1987 EQ.

OBSERVATIONS, MEASUREMENTS AND REDUCTIONS

Minor planet observations were performed using the Kodak II–O plates and three exposures on each plate were done.

Five reference stars of SAO Catalogue were selected per plate.

All the plates were measured on the Ascorecord Zeiss measuring mashine of the Observatoire Royal de Belgique by H. Debehogne.

The metod of dependences was used to obtain the precise positions.

The Least Square Method was taken to derive the residuals of the star positions.

The computations were performed at the Uccle Computing Center using UNIVAC 9200.

RESULTS

The results of observations collecting during this mission are presented in two tables.

Table I contains respectively: the ordinal number of each position, the object designation, ordinal number of the plate, date in UT, the topocentric coordinates α and δ for the equinox 1950. and the residuals.

For the new asteroids the calculated positions only are presented. In the Table II we give also the ordinal number of each position, the star identification (SAO number), the last digit of α and δ of the reference star (proper motions are included), the residuals on the reference stars, computed for each of three exposures and the dependences.

* This paper is dedicated to the memory of Dr.G. Teleki.

TABLE 1. POSITIONS.

NO	OBJECT	PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 °	'	"	RESIDUALS M	"
1	47 AGLAJA	10749	2	27.164930	10	33	16.518	+12	36	53.47	- .0	0
2	47 AGLAJA	10749	2	27.169791	10	33	16.283	+12	36	54.33	- .0	0
3	47 AGLAJA	10749	2	27.174653	10	33	16.038	+12	36	55.53	- .0	0
4	47 AGLAJA	10796	3	2.164236	10	30	43.948	+12	48	02.89	- .0	0
5	47 AGLAJA	10796	3	2.169097	10	30	43.723	+12	48	04.00	- .0	0
6	47 AGLAJA	10796	3	2.173958	10	30	43.488	+12	48	05.05	- .0	0
7	47 AGLAJA	10808	3	3.156597	10	29	53.722	+12	51	39.59	- .0	0
8	47 AGLAJA	10808	3	3.161458	10	29	53.463	+12	51	40.29	- .0	0
9	47 AGLAJA	10808	3	3.166319	10	29	53.194	+12	51	41.12	- .0	0
10	47 AGLAJA	10819	3	4.135069	10	29	4.364	+12	55	09.22	- .0	0
11	47 AGLAJA	10819	3	4.139930	10	29	4.138	+12	55	10.30	- .0	0
12	47 AGLAJA	10819	3	4.144792	10	29	3.871	+12	55	11.24	- .0	0
13	47 AGLAJA	10833	3	5.187152	10	28	11.503	+12	58	50.22	+ .0	0
14	47 AGLAJA	10833	3	5.192014	10	28	11.234	+12	58	51.25	+ .0	0
15	47 AGLAJA	10833	3	5.196875	10	28	10.964	+12	58	52.34	+ .0	0
16	47 AGLAJA	10845	3	6.174652	10	27	22.268	+13	02	14.30	+ .0	0
17	47 AGLAJA	10845	3	6.180902	10	27	21.972	+13	02	15.25	+ .0	0
18	47 AGLAJA	10845	3	6.187152	10	27	21.678	+13	02	16.30	+ .0	0
19	47 AGLAJA	10856	3	7.214931	10	26	30.711	+13	05	44.12	- .0	0
20	47 AGLAJA	10856	3	7.221180	10	26	30.418	+13	05	45.20	- .0	0
21	47 AGLAJA	10856	3	7.227430	10	26	30.111	+13	05	46.41	- .0	0
22	1070 TUNICA	10707	2	24.367013	11	5	10.378	+04	40	00.35	+ .0	0
23	1070 TUNICA	10707	2	24.371875	11	5	10.190	+04	40	02.63	+ .0	0
24	1070 TUNICA	10707	2	24.376736	11	5	10.000	+04	40	04.74	+ .0	0
25	1070 TUNICA	10721	2	25.347569	11	4	32.709	+04	47	33.03	+ .0	0
26	1070 TUNICA	10721	2	25.352430	11	4	32.490	+04	47	35.35	+ .0	0
27	1070 TUNICA	10721	2	25.357291	11	4	32.299	+04	47	37.67	+ .0	0
28	1070 TUNICA	10765	2	28.217708	11	2	40.986	+05	09	54.44	+ .0	0
29	1070 TUNICA	10765	2	28.222569	11	2	40.796	+05	09	56.74	+ .0	0
30	1070 TUNICA	10765	2	28.227430	11	2	40.609	+05	09	59.36	+ .0	0
31	1070 TUNICA	10799	3	2.274652	11	1	19.428	+05	26	06.37	+ .0	0
32	1070 TUNICA	10799	3	2.279514	11	1	19.231	+05	26	08.67	+ .0	0
33	1070 TUNICA	10799	3	2.284375	11	1	19.043	+05	26	11.00	+ .0	0
34	1070 TUNICA	10811	3	3.267708	11	0	39.853	+05	33	58.50	- .0	0
35	1070 TUNICA	10811	3	3.272569	11	0	39.648	+05	34	00.81	- .0	0
36	1070 TUNICA	10811	3	3.277431	11	0	39.437	+05	34	02.92	- .0	0
37	1070 TUNICA	10822	3	4.258680	11	0	0.368	+05	41	49.79	- .0	0
38	1070 TUNICA	10822	3	4.263541	11	0	0.178	+05	41	51.74	- .0	0
39	1070 TUNICA	10822	3	4.268403	10	59	59.985	+05	41	54.00	- .0	0
40	1223 NECKAR	10687	2	23.267014	10	43	26.939	+11	51	13.74	+ .1	0
41	1223 NECKAR	10687	2	23.271875	10	43	26.702	+11	51	14.89	+ .1	0
42	1223 NECKAR	10687	2	23.276736	10	43	26.453	+11	51	16.17	+ .1	0
43	1223 NECKAR	10701	2	24.258680	10	42	37.202	+11	55	54.63	+ .0	0
44	1223 NECKAR	10701	2	24.263541	10	42	36.948	+11	55	56.18	+ .0	0
45	1223 NECKAR	10701	2	24.268403	10	42	36.708	+11	55	57.22	+ .0	0
46	1223 NECKAR	10727	2	26.095486	10	41	4.632	+12	04	30.08	+ .0	0
47	1223 NECKAR	10727	2	26.100347	10	41	4.413	+12	04	31.46	+ .0	0
48	1223 NECKAR	10727	2	26.105208	10	41	4.180	+12	04	33.00	+ .0	0
49	1223 NECKAR	10749	2	27.164930	10	40	10.445	+12	09	27.76	+ .0	0
50	1223 NECKAR	10749	2	27.169791	10	40	10.203	+12	09	28.87	+ .0	0

TABLE 1. POSITIONS.

NO	OBJECT	PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 °	'	''	RESIDUALS	M	''
51	1223 NECKAR	10749	2	27.174653	10	40	9.965	+12	09	30.30	+	.0	0
52	1223 NECKAR	10796	3	2.164236	10	37	38.418	+12	23	04.44	+	.0	0
53	1223 NECKAR	10796	3	2.169097	10	37	38.192	+12	23	05.86	+	.0	0
54	1223 NECKAR	10796	3	2.173958	10	37	37.921	+12	23	07.24	+	.0	0
55	1223 NECKAR	10808	3	3.156597	10	36	48.375	+12	27	27.35	+	.0	0
56	1223 NECKAR	10808	3	3.161458	10	36	48.119	+12	27	28.70	+	.0	0
57	1223 NECKAR	10808	3	3.166319	10	36	47.861	+12	27	30.03	+	.0	0
58	1223 NECKAR	10819	3	4.135069	10	35	59.249	+12	31	42.68	+	.0	0
59	1223 NECKAR	10819	3	4.139930	10	35	59.009	+12	31	44.00	+	.0	0
60	1223 NECKAR	10819	3	4.144792	10	35	58.769	+12	31	45.60	+	.0	0
61	1223 NECKAR	10833	3	5.187152	10	35	6.597	+12	36	14.07	+	.0	0
62	1223 NECKAR	10833	3	5.192014	10	35	6.350	+12	36	15.48	+	.0	0
63	1223 NECKAR	10833	3	5.196875	10	35	6.109	+12	36	16.38	+	.0	0
64	1223 NECKAR	10845	3	6.174652	10	34	17.579	+12	40	23.59	+	.0	0
65	1223 NECKAR	10845	3	6.180902	10	34	17.285	+12	40	25.00	+	.0	0
66	1223 NECKAR	10845	3	6.187152	10	34	17.000	+12	40	26.59	+	.0	0
67	1223 NECKAR	10856	3	7.214931	10	33	26.156	+12	44	41.04	-	.0	0
68	1223 NECKAR	10856	3	7.221180	10	33	25.838	+12	44	42.63	-	.0	0
69	1223 NECKAR	10856	3	7.227430	10	33	25.517	+12	44	44.22	-	.0	0
70	1302 WERRA	10687	2	23.267014	10	45	48.860	+11	46	17.15	+	.1	0
71	1302 WERRA	10687	2	23.271875	10	45	48.638	+11	46	19.04	+	.1	0
72	1302 WERRA	10687	2	23.276736	10	45	48.396	+11	46	20.36	+	.1	0
73	1302 WERRA	10701	2	24.258680	10	45	2.167	+11	51	23.58	+	.0	0
74	1302 WERRA	10701	2	24.263541	10	45	1.956	+11	51	25.08	+	.0	0
75	1302 WERRA	10701	2	24.268403	10	45	1.722	+11	51	26.24	+	.0	0
76	1302 WERRA	10727	2	26.095486	10	43	35.378	+12	00	46.00	+	.0	0
77	1302 WERRA	10727	2	26.100347	10	43	35.150	+12	00	47.35	+	.0	0
78	1302 WERRA	10727	2	26.105208	10	43	34.917	+12	00	48.83	+	.0	0
79	1361 LEUSCHNERIA	10707	2	24.367013	11	2	7.834	+04	37	19.54	-	.0	0
80	1361 LEUSCHNERIA	10707	2	24.371875	11	2	7.633	+04	37	22.16	-	.0	0
81	1361 LEUSCHNERIA	10707	2	24.376736	11	2	7.460	+04	37	24.77	-	.0	0
82	1361 LEUSCHNERIA	10721	2	25.347569	11	1	28.911	+04	45	54.79	-	.0	0
83	1361 LEUSCHNERIA	10721	2	25.352430	11	1	28.714	+04	45	57.39	-	.0	0
84	1361 LEUSCHNERIA	10721	2	25.357291	11	1	28.521	+04	46	00.05	-	.0	0
85	1361 LEUSCHNERIA	10765	2	28.217708	10	59	33.354	+05	11	24.60	+	.0	0
86	1361 LEUSCHNERIA	10765	2	28.222569	10	59	33.144	+05	11	27.09	+	.0	0
87	1361 LEUSCHNERIA	10765	2	28.227430	10	59	32.942	+05	11	29.86	+	.0	0
88	1361 LEUSCHNERIA	10799	3	2.274652	10	58	9.193	+05	29	51.63	+	.0	0
89	1361 LEUSCHNERIA	10799	3	2.279514	10	58	9.016	+05	29	54.13	+	.0	0
90	1361 LEUSCHNERIA	10799	3	2.284375	10	58	8.810	+05	29	56.63	+	.0	0
91	1361 LEUSCHNERIA	10811	3	3.267708	10	57	28.266	+05	38	48.55	+	.0	0
92	1361 LEUSCHNERIA	10811	3	3.272569	10	57	28.070	+05	38	51.16	+	.0	0
93	1361 LEUSCHNERIA	10811	3	3.277431	10	57	27.894	+05	38	53.43	+	.0	0
94	1361 LEUSCHNERIA	10822	3	4.258680	10	56	47.509	+05	47	44.01	+	.0	0
95	1361 LEUSCHNERIA	10822	3	4.263541	10	56	47.317	+05	47	47.01	+	.0	0
96	1361 LEUSCHNERIA	10822	3	4.268403	10	56	47.117	+05	47	49.47	+	.0	0
97	1361 LEUSCHNERIA	11832	3	5.169791	10	56	10.017	+05	55	56.51	+	.0	0
98	1361 LEUSCHNERIA	11832	3	5.174652	10	56	9.817	+05	55	59.00	+	.0	0
99	1361 LEUSCHNERIA	11832	3	5.179513	10	56	9.620	+05	56	01.60	+	.0	0
100	1361 LEUSCHNERIA	11859	3	7.246527	10	54	40.151	+06	15	35.01	-	.0	0

TABLE 1. POSITIONS.

NO	OBJECT		PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 °	'	''	RESIDUALS	M	''
101	1361	LEUSCHNERIA	11859	3	7.352083	10	54	39.926	+06	15	37.92	-	.0	0
102	1361	LEUSCHNERIA	11859	3	7.357638	10	54	39.701	+06	15	40.76	-	.0	0
103	1361	LEUSCHNERIA	11888	3	10.253471	10	52	41.074	+06	41	43.63	-	.1	0
104	1361	LEUSCHNERIA	11888	3	10.259027	10	52	40.880	+06	41	46.63	-	.1	0
105	1361	LEUSCHNERIA	11888	3	10.264583	10	52	40.658	+06	41	49.71	-	.1	0
106	1376	MICHELLE	10707	2	24.367013	10	58	53.609	+06	13	09.67	+	.0	0
107	1376	MICHELLE	10707	2	24.371875	10	58	53.324	+06	13	11.72	+	.0	0
108	1376	MICHELLE	10707	2	24.376736	10	58	53.046	+06	13	13.77	+	.0	0
109	1376	MICHELLE	10721	2	25.347569	10	57	57.549	+06	20	11.48	+	.1	- 1
110	1376	MICHELLE	10721	2	25.352430	10	57	57.278	+06	20	13.58	+	.1	- 1
111	1376	MICHELLE	10721	2	25.357291	10	57	57.000	+06	20	15.68	+	.1	- 1
112	2178	KAZAKHSTANIA	10687	2	23.267014	10	46	9.168	+10	54	34.70	+	.0	0
113	2178	KAZAKHSTANIA	10687	2	23.271875	10	46	8.873	+10	54	36.24	+	.0	0
114	2178	KAZAKHSTANIA	10687	2	23.276736	10	46	8.577	+10	54	37.81	+	.0	0
115	2178	KAZAKHSTANIA	10701	2	24.258680	10	45	6.104	+10	59	55.19	-	.0	+ 1
116	2178	KAZAKHSTANIA	10701	2	24.263541	10	45	5.799	+10	59	56.71	-	.0	+ 1
117	2178	KAZAKHSTANIA	10701	2	24.268403	10	45	5.469	+10	59	57.83	-	.0	+ 1
118	2390	NEZARKA	11749	2	27.180208	10	40	38.705	+04	21	26.94	+	.1	- 1
119	2390	NEZARKA	11749	2	27.185416	10	40	38.412	+04	21	27.59	+	.1	- 1
120	2390	NEZARKA	11749	2	27.190625	10	40	38.135	+04	21	28.31	+	.1	- 1
121	2390	NEZARKA	10781	3	1.189930	10	38	43.372	+04	26	47.92	+	.1	- 1
122	2390	NEZARKA	10781	3	1.195138	10	38	43.065	+04	26	48.59	+	.1	- 1
123	2390	NEZARKA	10781	3	1.200347	10	38	42.756	+04	26	49.50	+	.1	- 1
124	2390	NEZARKA	11796	3	2.180208	10	37	46.449	+04	29	28.75	+	.0	- 1
125	2390	NEZARKA	11796	3	2.185069	10	37	46.194	+04	29	29.81	+	.0	- 1
126	2390	NEZARKA	11796	3	2.189930	10	37	45.904	+04	29	30.26	+	.0	- 1
127	2390	NEZARKA	11808	3	3.171875	10	36	49.500	+04	32	11.24	+	.0	0
128	2390	NEZARKA	11808	3	3.177083	10	36	49.205	+04	32	12.03	+	.0	0
129	2390	NEZARKA	11808	3	3.182292	10	36	48.899	+04	32	13.16	+	.0	0
130	2390	NEZARKA	11819	3	4.151736	10	35	53.404	+04	34	53.91	+	.0	0
131	2390	NEZARKA	11819	3	4.156597	10	35	53.108	+04	34	54.64	+	.0	0
132	2390	NEZARKA	11819	3	4.161458	10	35	52.839	+04	34	55.46	+	.0	0
133	2390	NEZARKA	11833	3	5.202430	10	34	53.347	+04	37	48.08	+	.0	0
134	2390	NEZARKA	11833	3	5.207292	10	34	53.073	+04	37	48.91	+	.0	0
135	2390	NEZARKA	11833	3	5.212152	10	34	52.794	+04	37	49.72	+	.0	0
136	2390	NEZARKA	11845	3	6.194097	10	33	56.984	+04	40	33.44	+	.0	0
137	2390	NEZARKA	11845	3	6.200694	10	33	56.638	+04	40	34.86	+	.0	0
138	2390	NEZARKA	11845	3	6.207292	10	33	56.257	+04	40	36.00	+	.0	0
139	2888	HODGSON	10687	2	23.267014	10	42	48.699	+12	06	19.74	-	.0	0
140	2888	HODGSON	10687	2	23.271875	10	42	48.374	+12	06	20.15	-	.0	0
141	2888	HODGSON	10687	2	23.276736	10	42	48.055	+12	06	20.81	-	.0	0
142	2888	HODGSON	10701	2	24.258680	10	41	40.163	+12	08	40.16	-	.0	0
143	2888	HODGSON	10701	2	24.263541	10	41	39.830	+12	08	40.68	-	.0	0
144	2888	HODGSON	10701	2	24.268403	10	41	39.495	+12	08	41.33	-	.0	0
145	2888	HODGSON	10727	2	26.095486	10	39	33.091	+12	12	50.58	-	.0	+ 1
146	2888	HODGSON	10727	2	26.100347	10	39	32.747	+12	12	51.00	-	.0	+ 1
147	2888	HODGSON	10727	2	26.105208	10	39	32.416	+12	12	51.58	-	.0	+ 1
148	2888	HODGSON	10749	2	27.164930	10	38	18.748	+12	15	11.28	-	.0	+ 1
149	2888	HODGSON	10749	2	27.169791	10	38	18.441	+12	15	11.94	-	.0	+ 1
150	2888	HODGSON	10749	2	27.174653	10	38	18.108	+12	15	12.66	-	.0	+ 1

TABLE 1. POSITIONS.

NO	OBJECT		PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 °	'	"	RESIDUALS S		"	
151	2888	HODGSON	10796	3	2.164236	10	34	51.695	+12	21	18.00	-	.0	+	1
152	2888	HODGSON	10796	3	2.169097	10	34	51.359	+12	21	18.29	-	.0	+	1
153	2888	HODGSON	10796	3	2.173958	10	34	51.023	+12	21	18.87	-	.0	+	1
154	2888	HODGSON	10808	3	3.156597	10	33	43.947	+12	23	08.64	-	.0	+	1
155	2888	HODGSON	10808	3	3.161458	10	33	43.624	+12	23	09.07	-	.0	+	1
156	2888	HODGSON	10808	3	3.166319	10	33	43.266	+12	23	09.65	-	.0	+	1
157	2888	HODGSON	10819	3	4.135069	10	32	37.662	+12	24	52.10	-	.0	+	1
158	2888	HODGSON	10819	3	4.139930	10	32	37.346	+12	24	52.38	-	.0	+	1
159	2888	HODGSON	10819	3	4.144792	10	32	37.015	+12	24	52.70	-	.0	+	1
160	2888	HODGSON	10833	3	5.187152	10	31	26.817	+12	26	37.30	+	.0		0
161	2888	HODGSON	10833	3	5.192014	10	31	26.481	+12	26	37.91	+	.0		0
162	2888	HODGSON	10833	3	5.196875	10	31	26.155	+12	26	38.27	+	.0		0
163	2888	HODGSON	10845	3	6.174652	10	30	21.210	+12	28	10.00	+	.0		0
164	2888	HODGSON	10845	3	6.180902	10	30	20.833	+12	28	10.33	+	.0		0
165	2888	HODGSON	10845	3	6.187152	10	30	20.453	+12	28	10.63	+	.0		0
166	2888	HODGSON	10856	3	7.214931	10	29	12.831	+12	29	40.67	-	.1	+	1
167	2888	HODGSON	10856	3	7.221180	10	29	12.454	+12	29	41.24	-	.1	+	1
168	2888	HODGSON	10856	3	7.227430	10	29	12.077	+12	29	41.59	-	.1	+	1
169	3143	1980 UA	10687	2	23.267014	10	45	57.718	+12	45	57.37	-	.0		0
170	3143	1980 UA	10687	2	23.271875	10	45	57.479	+12	45	58.72	-	.0		0
171	3143	1980 UA	10687	2	23.276736	10	45	57.236	+12	46	00.12	-	.0		0
172	3143	1980 UA	10701	2	24.258680	10	45	8.403	+12	51	15.63	-	.0		0
173	3143	1980 UA	10701	2	24.263541	10	45	8.151	+12	51	17.19	-	.0		0
174	3143	1980 UA	10701	2	24.268403	10	45	7.907	+12	51	18.47	-	.0		0
175	3143	1980 UA	10727	2	26.095486	10	43	36.674	+13	00	55.38	-	.0		0
176	3143	1980 UA	10727	2	26.100347	10	43	36.439	+13	00	57.00	-	.0		0
177	3143	1980 UA	10727	2	26.105208	10	43	36.191	+13	00	58.45	-	.0		0
178		1987 DL6	10687	2	23.267014	10	42	26.775	+12	25	53.03				
179		1987 DL6	10687	2	23.271875	10	42	26.455	+12	25	53.10				
180		1987 DL6	10687	2	23.276736	10	42	26.138	+12	25	53.40				
181		1987 DL6	10701	2	24.258680	10	41	21.157	+12	26	53.77				
182		1987 DL6	10701	2	24.263541	10	41	20.842	+12	26	54.07				
183		1987 DL6	10701	2	24.268403	10	41	20.533	+12	26	54.38				
184		1987 DL6	10727	2	26.095486	10	39	18.977	+12	28	37.27				
185		1987 DL6	10727	2	26.100347	10	39	18.650	+12	28	37.56				
186		1987 DL6	10727	2	26.105208	10	39	18.335	+12	28	37.75				
187		1987 DL6	10749	2	27.164930	10	38	6.946	+12	29	31.84				
188		1987 DL6	10749	2	27.169791	10	38	6.622	+12	29	32.08				
189		1987 DL6	10749	2	27.174653	10	38	6.306	+12	29	32.17				
190		1987 DL6	10796	3	2.164236	10	34	45.194	+12	31	34.20				
191		1987 DL6	10796	3	2.169097	10	34	44.831	+12	31	34.42				
192		1987 DL6	10796	3	2.173958	10	34	44.515	+12	31	34.74				
193		1987 DL6	10808	3	3.156597	10	33	38.718	+12	32	03.79				
194		1987 DL6	10808	3	3.161458	10	33	38.395	+12	32	04.00				
195		1987 DL6	10808	3	3.166319	10	33	38.088	+12	32	04.11				
196		1987 DL6	10819	3	4.135069	10	32	33.602	+12	32	28.13				
197		1987 DL6	10819	3	4.139930	10	32	33.285	+12	32	28.19				
198		1987 DL6	10819	3	4.144792	10	32	32.946	+12	32	28.34				
199		1987 DL6	10833	3	5.187152	10	31	23.931	+12	32	46.00				
200		1987 DL6	10833	3	5.192014	10	31	23.584	+12	32	46.06				

TABLE 1. POSITIONS.

NO	OBJECT	PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 °	'	"	RESIDUALS M "
201	1987 DL6	10833	3	5.196875	10	31	23.248	+12	32	46.45	
202	1987 DL6	10845	3	6.174652	10	30	19.235	+12	32	57.03	
203	1987 DL6	10845	3	6.180902	10	30	18.775	+12	32	57.03	
204	1987 DL6	10845	3	6.187152	10	30	18.362	+12	32	57.07	
205	1987 DL6	10856	3	7.214931	10	29	11.642	+12	33	00.62	
206	1987 DL6	10856	3	7.221180	10	29	11.240	+12	33	00.64	
207	1987 DL6	10856	3	7.227430	10	29	10.806	+12	33	00.67	
208	1987 DM6	11749	2	27.180208	10	38	20.811	+04	05	38.39	
209	1987 DM6	11749	2	27.185416	10	38	20.517	+04	05	40.64	
210	1987 DM6	11749	2	27.190625	10	38	20.234	+04	05	43.18	
211	1987 DM6	10781	3	1.189930	10	36	32.343	+04	21	58.42	
212	1987 DM6	10781	3	1.195138	10	36	32.059	+04	22	00.54	
213	1987 DM6	10781	3	1.200347	10	36	31.784	+04	22	03.41	
214	1987 DM6	11796	3	2.180208	10	35	39.210	+04	30	04.16	
215	1987 DM6	11796	3	2.185069	10	35	38.966	+04	30	06.05	
216	1987 DM6	11796	3	2.189930	10	35	38.717	+04	30	08.88	
217	1987 DM6	11808	3	3.171875	10	34	46.365	+04	38	13.08	
218	1987 DM6	11808	3	3.177083	10	34	46.063	+04	38	15.94	
219	1987 DM6	11808	3	3.182292	10	34	45.796	+04	38	18.29	
220	1987 DM6	11819	3	4.151736	10	33	54.484	+04	46	16.63	
221	1987 DM6	11819	3	4.156597	10	33	54.234	+04	46	19.25	
222	1987 DM6	11819	3	4.161458	10	33	53.981	+04	46	21.42	
223	1987 DM6	11833	3	5.202430	10	32	59.257	+04	54	55.09	
224	1987 DM6	11833	3	5.207292	10	32	59.000	+04	54	57.71	
225	1987 DM6	11833	3	5.212152	10	32	58.737	+04	55	00.08	
226	1987 DM6	11845	3	6.194097	10	32	7.897	+05	03	04.19	
227	1987 DM6	11845	3	6.200694	10	32	7.563	+05	03	07.34	
228	1987 DM6	11845	3	6.207292	10	32	7.222	+05	03	10.58	
229	1987 DM6	11856	3	7.236805	10	31	14.476	+05	11	36.41	
230	1987 DM6	11856	3	7.243750	10	31	14.114	+05	11	39.93	
231	1987 DM6	11856	3	7.250694	10	31	13.777	+05	11	43.40	
232	1987 DF6	11856	3	7.236805	10	24	24.691	+06	03	05.66	
233	1987 DF6	11856	3	7.243750	10	24	24.253	+06	03	05.80	
234	1987 DF6	11856	3	7.250694	10	24	23.813	+06	03	05.88	
235	1987 EP	10707	2	24.367013	10	59	38.322	+05	08	53.57	
236	1987 EP	10707	2	24.371875	10	59	38.035	+05	08	54.05	
237	1987 EP	10707	2	24.376736	10	59	37.750	+05	08	54.50	
238	1987 EP	10721	2	25.347569	10	58	41.289	+05	10	33.36	
239	1987 EP	10721	2	25.352430	10	58	41.006	+05	10	33.89	
240	1987 EP	10721	2	25.357291	10	58	40.723	+05	10	34.38	
241	1987 EP	11751	2	27.255903	10	56	49.237	+05	13	53.59	
242	1987 EP	11751	2	27.260764	10	56	48.956	+05	13	54.10	
243	1987 EP	11751	2	27.265625	10	56	48.667	+05	13	54.62	
244	1987 EP	10765	2	28.217708	10	55	52.364	+05	15	37.17	
245	1987 EP	10765	2	28.222569	10	55	52.058	+05	15	37.88	
246	1987 EP	10765	2	28.227430	10	55	51.746	+05	15	38.41	
247	1987 EP	10799	3	2.274652	10	53	49.990	+05	19	22.04	
248	1987 EP	10799	3	2.279514	10	53	49.692	+05	19	22.73	
249	1987 EP	10799	3	2.284375	10	53	49.398	+05	19	23.24	
250	1987 EP	10811	3	3.267708	10	52	50.792	+05	21	12.27	

294 PHOTOGRAPHIC POSITIONS OF MINOR PLANETS OBTAINED WITH THE GPO TELESCOPE OF ESO – LA SILLA IN 1987

TABLE 1. POSITIONS.

NO	OBJECT	PLATE	DATE UT 1987 MON.	DAY	ALPHA 1950 H	M	S	DELTA 1950 O	'	''	RESIDUALS M	''
251	1987 EP	10811	3	3.272569	10	52	50.500	+05	21	13.00		
252	1987 EP	10811	3	3.277431	10	52	50.206	+05	21	13.79		
253	1987 EP	11832	3	5.169791	10	50	57.528	+05	24	45.18		
254	1987 EP	11832	3	5.174652	10	50	57.254	+05	24	45.82		
255	1987 EP	11832	3	5.179513	10	50	56.962	+05	24	46.33		
256	1987 EP	11847	3	6.265972	10	49	52.183	+05	26	48.25		
257	1987 EP	11847	3	6.271527	10	49	51.837	+05	26	48.84		
258	1987 EP	11847	3	6.277082	10	49	51.487	+05	26	49.48		
259	1987 EP	11859	3	7.346527	10	48	47.985	+05	28	48.39		
260	1987 EP	11859	3	7.352083	10	48	47.673	+05	28	49.72		
261	1987 EP	11859	3	7.357638	10	48	47.368	+05	28	50.30		
262	1987 EP	11888	3	10.253471	10	45	57.230	+05	34	11.80		
263	1987 EP	11888	3	10.259027	10	45	56.882	+05	34	12.03		
264	1987 EP	11888	3	10.264583	10	45	56.572	+05	34	12.63		
265	1987 EQ	10707	2	24.367013	11	6	0.418	+04	42	57.26		
266	1987 EQ	10707	2	24.371875	11	6	0.126	+04	42	58.48		
267	1987 EQ	10707	2	24.376736	11	5	59.834	+04	42	59.81		
268	1987 EQ	10721	2	25.347569	11	5	2.110	+04	47	15.76		
269	1987 EQ	10721	2	25.352430	11	5	1.822	+04	47	17.01		
270	1987 EQ	10721	2	25.357291	11	5	1.533	+04	47	18.34		
271	1987 EQ	10765	2	28.217708	11	2	7.726	+05	00	21.04		
272	1987 EQ	10765	2	28.222569	11	2	7.435	+05	00	23.07		
273	1987 EQ	10765	2	28.227430	11	2	7.140	+05	00	23.87		
274	1987 EQ	10799	3	2.274652	10	59	59.456	+05	10	02.30		
275	1987 EQ	10799	3	2.279514	10	59	59.148	+05	10	03.71		
276	1987 EQ	10799	3	2.284375	10	59	58.854	+05	10	05.32		
277	1987 EQ	10811	3	3.267708	10	58	57.101	+05	14	46.82		
278	1987 EQ	10811	3	3.272569	10	58	56.797	+05	14	48.17		
279	1987 EQ	10811	3	3.277431	10	58	56.509	+05	14	49.63		
280	1987 EQ	10822	3	4.258680	10	57	54.624	+05	19	31.90		
281	1987 EQ	10822	3	4.263541	10	57	54.318	+05	19	33.12		
282	1987 EQ	10822	3	4.268403	10	57	54.015	+05	19	34.83		
283	1987 EQ	11832	3	5.169791	10	56	57.332	+05	23	56.14		
284	1987 EQ	11832	3	5.174652	10	56	57.005	+05	23	57.38		
285	1987 EQ	11832	3	5.179513	10	56	56.687	+05	23	58.89		
286	1987 EQ	11847	3	6.265972	10	55	47.824	+05	29	14.20		
287	1987 EQ	11847	3	6.271527	10	55	47.447	+05	29	15.82		
288	1987 EQ	11847	3	6.277082	10	55	47.096	+05	29	17.43		
289	1987 EQ	11859	3	7.346527	10	54	39.415	+05	34	27.67		
290	1987 EQ	11859	3	7.352083	10	54	39.063	+05	34	29.53		
291	1987 EQ	11859	3	7.357638	10	54	38.715	+05	34	31.57		
292	1987 EQ	11888	3	10.253471	10	51	37.569	+05	48	28.30		
293	1987 EQ	11888	3	10.259027	10	51	37.203	+05	48	29.87		
294	1987 EQ	11888	3	10.264583	10	51	36.835	+05	48	31.46		

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS			NO SAO	POSITIONS USED		STAR RESIDUALS						DEPENDENCES		
				s	"	s	"	s	"	s	"			
1	2	3	99255	+26.059	58.73	-0.014	-0.05	-0.001	+0.14	-0.004	-0.13	-0.192856	-0.192914	-0.192862
			99210	+22.451	33.96	+0.007	-0.26	-0.002	-0.59	-0.003	-0.16	+0.591735	+0.592281	+0.592826
			99217	+55.341	47.85	+0.007	+0.53	+0.004	+0.82	+0.012	+0.47	+0.590534	+0.590795	+0.591054
			99245	+58.669	25.08	-0.028	-0.53	-0.004	-0.46	-0.016	-0.60	+0.207506	+0.207183	+0.206894
			99263	+28.272	21.30	+0.027	+0.30	+0.003	+0.08	+0.012	+0.42	-0.196919	-0.197345	-0.197913
4	5	6	99185	+28.105	58.47	+0.010	-0.68	+0.003	-0.20	-0.002	+0.09	+0.565993	+0.566393	+0.566789
			99187	+13.938	17.46	+0.002	+0.77	+0.006	+0.14	+0.015	-0.02	+0.405840	+0.405877	+0.405949
			99210	+22.451	33.96	-0.047	-0.29	-0.035	+0.24	-0.050	-0.29	+0.310119	+0.310403	+0.310672
			99227	+08.593	19.91	+0.050	+0.59	+0.039	-0.20	+0.058	+0.30	+0.058391	+0.058338	+0.058296
			99245	+58.669	25.08	-0.015	-0.38	-0.013	+0.02	-0.021	-0.08	-0.340342	-0.341010	-0.341707
7	8	9	99234	+47.606	15.84	-0.036	-0.05	-0.030	-0.11	-0.040	+0.30	-0.164807	-0.165238	-0.165612
			99227	+08.593	19.91	+0.032	+0.03	+0.026	+0.07	+0.034	-0.26	+0.061562	+0.061352	+0.061084
			99175	+54.278	17.68	-0.009	-0.10	-0.012	-0.18	-0.014	+0.11	+0.787859	+0.788460	+0.789131
			99187	+13.938	17.46	-0.003	+0.23	+0.008	+0.39	+0.007	-0.07	+0.308839	+0.308984	+0.309098
			99197	+26.089	17.94	+0.016	-0.11	+0.008	-0.17	+0.012	-0.08	+0.006547	+0.006442	+0.006299
10	11	12	99187	+13.938	17.46	+0.005	+0.19	+0.005	-0.12	-0.021	-0.06	+0.100911	+0.100652	+0.100574
			99217	+55.341	47.85	+0.007	+0.29	+0.019	+0.02	+0.022	+0.08	-0.336267	-0.336959	-0.337657
			99210	+22.451	33.96	-0.004	-0.18	-0.012	-0.02	-0.016	-0.06	+0.007955	+0.007915	+0.007726
			99175	+54.278	17.68	+0.010	+0.40	+0.022	-0.06	+0.008	+0.04	+0.852905	+0.853578	+0.854496
			99185	+28.105	58.47	-0.017	-0.70	-0.033	+0.18	+0.007	-0.01	+0.374497	+0.374813	+0.374862
13	14	15	99187	+13.938	17.46	-0.016	-0.10	+0.005	+0.03	-0.005	+0.22	+0.221448	+0.221317	+0.221292
			99217	+55.341	47.85	+0.018	+0.00	+0.038	-0.01	+0.040	+0.07	-0.363471	-0.364146	-0.364756
			99210	+22.451	33.96	-0.014	-0.01	-0.028	+0.01	-0.030	-0.05	-0.182004	-0.182270	-0.182575
			99174	+27.365	36.29	+0.006	-0.04	+0.030	+0.01	+0.026	+0.15	+0.900645	+0.901334	+0.902143
			99185	+28.105	58.47	+0.006	+0.14	-0.045	-0.04	-0.031	-0.39	+0.423361	+0.423766	+0.423896
16	17	18	99155	+33.975	21.67	+0.013	+0.20	+0.017	+0.04	+0.010	+0.05	+0.606971	+0.607639	+0.608342
			99175	+54.278	17.68	-0.020	-0.26	-0.024	+0.01	-0.007	+0.07	+0.223036	+0.222947	+0.222824
			99185	+28.105	58.47	-0.025	-0.57	-0.044	-0.31	-0.048	-0.65	+0.012263	+0.011830	+0.011346
			99186	+43.487	20.97	+0.038	+0.73	+0.059	+0.29	+0.052	+0.58	-0.048470	-0.049060	-0.049566
			99162	+46.577	15.84	-0.006	-0.11	-0.009	-0.03	-0.006	-0.06	+0.206200	+0.206643	+0.207054
19	20	21	99187	+13.938	17.46	-0.001	+0.45	+0.023	+0.68	-0.011	-0.09	-0.172909	-0.173505	-0.174061
			99185	+28.105	58.47	-0.002	-0.44	-0.029	-0.59	+0.006	+0.12	-0.031608	-0.031961	-0.032412
			99175	+54.278	17.68	+0.004	-0.10	+0.005	-0.25	+0.009	-0.03	+0.223682	+0.223600	+0.223531
			99162	+46.577	15.84	+0.000	-0.06	-0.002	-0.09	+0.002	+0.01	+0.276552	+0.276959	+0.277364
			99155	+33.975	21.67	-0.002	+0.15	+0.004	+0.26	-0.006	-0.01	+0.704283	+0.704906	+0.705577
22	23	24	118652	+58.786	06.88	+0.005	+0.01	+0.002	-0.10	+0.002	-0.07	+0.282959	+0.283961	+0.284940
			118676	+25.452	29.89	-0.002	+0.10	-0.005	+0.14	+0.004	+0.09	-0.011211	-0.011051	-0.010922
			118686	+14.571	16.75	+0.020	+0.15	+0.002	-0.30	+0.013	-0.24	+0.480306	+0.479720	+0.479033
			118681	+45.288	46.27	-0.031	-0.24	-0.003	+0.47	-0.020	+0.37	+0.331042	+0.330533	+0.330267
			118684	+10.966	49.03	+0.009	-0.03	+0.005	-0.21	+0.001	-0.15	-0.083096	-0.083163	-0.083317
25	26	27	118606	+59.527	19.83	-0.009	+0.32	-0.018	+0.12	-0.010	+0.11	+0.329590	+0.329500	+0.329382
			118619	+28.183	09.19	-0.005	-0.28	-0.005	-0.14	-0.010	-0.11	-0.813585	-0.812587	-0.811638
			118644	+43.741	41.47	+0.037	-0.03	+0.059	+0.10	+0.054	+0.04	+0.251039	+0.251028	+0.250987
			118652	+58.786	06.88	-0.007	-0.31	-0.009	-0.17	-0.014	-0.12	+1.136505	+1.135459	+1.134502
			118672	+56.557	52.04	-0.016	+0.31	-0.028	+0.09	-0.020	+0.09	+0.096451	+0.096601	+0.096768
28	29	30	118606	+59.527	19.83	+0.008	-0.08	+0.011	-0.14	+0.010	-0.06	+0.078114	+0.077785	+0.077345
			118622	+06.800	15.85	-0.008	+0.31	-0.005	+0.57	-0.006	+0.28	+0.034942	+0.035271	+0.035689
			118619	+28.183	09.19	-0.014	-0.10	-0.024	-0.24	-0.021	-0.14	-0.166728	-0.165875	-0.164950
			118652	+58.786	06.88	-0.022	+0.07	-0.033	+0.07	-0.030	+0.01	+0.697776	+0.696905	+0.696037
			118644	+43.741	41.47	+0.035	-0.19	+0.051	-0.27	+0.047	-0.09	+0.355896	+0.355915	+0.355878
31	32	33	118631	+05.807	21.27	+0.042	-0.76	+0.033	-0.52	+0.042	-0.72	+0.724288	+0.723413	+0.722646
			118621	+32.926	58.44	-0.010	+0.24	-0.016	+0.45	-0.011	+0.47	+0.220850	+0.221183	+0.221565
			118584	+73.137	53.97	-0.006	+0.14	-0.008	+0.19	-0.007	+0.22	-0.285120	-0.285006	-0.284899
			118622	+06.800	15.85	-0.057	+0.98	-0.040	+0.54	-0.056	+0.81	+0.467438	+0.467185	+0.466792
			118603	+35.749	25.40	+0.030	-0.60	+0.031	-0.66	+0.031	-0.78	-0.127454	-0.126774	-0.126106
34	35	36	118631	+05.807	21.27	+0.032	-0.46	+0.013	-0.30	+0.016	-0.37	+0.627355	+0.626618	+0.625924
			118619	+28.183	09.19	-0.019	+0.75	-0.004	+0.48	-0.009	+0.65	+0.502381	+0.502391	+0.502356
			118603	+35.749	25.40	-0.035	-0.28	-0.021	-0.16	-0.019	-0.28	+0.275627	+0.276094	+0.276489
			118579	+55.445	27.00	+0.051	-0.24	+0.026	-0.17	+0.027	-0.16	-0.159465	-0.158955	-0.158390
			118584	+73.137	53.97	-0.029	+0.22	-0.014	+0.15	-0.015	+0.16	-0.245898	-0.246148	-0.246379
37	38	39	118614	+07.821	51.82	-0.010	+0.22	-0.012	+0.34	-0.035	+0.31	+0.543143	+0.543276	+0.543376
			118603	+35.749	25.40	+0.008	-0.20	+0.003	-0.31	+0.035	-0.48	+0.299787	+0.300165	+0.300682
			118585	+45.972	32.11	+0.001	+0.02	+0.011	+0.02	-0.005	+0.29	-0.181746	-0.181280	-0.180846
			118594	+48.102	27.11	-0.003	+0.04	-0.010	+0.07	-0.006	-0.12	-0.254282	-0.254491	-0.254752
			118631	+05.807	21.27	+0.004	-0.07	+0.008	-0.12	+0.011	-0.01	+0.593098	+0.592330	+0.591540
40	41	42	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	+0.148362	+0.148528	+0.148728
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	-0.121365	-0.122309	-0.123321
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	+0.279873	+0.280234	+0.280608
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	+0.213140	+0.212972	+0.212792
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	+0.479990	+0.480575	+0.481193
43	44	45	99299	+33.412	22.03	+0.018	+0.47	+0.022	+0.49	+0.026	+0.44	+0.213380	+0.212736	+0.212084
			99271	+43.332	54.15	+0.021	+0.35	+0.024	+0.42	+0.023	+0.66	+0.188301	+0.188470	+0.188664
			99268	+26.631	49.06	+0.009	+0.40	+0.012	+0.37	+0.018	+0.13	+0.182964	+0.183176	+0.183420
			99285	+58.683	54.55	-0.036	-0.92	-0.043	-0.96	-0.050	-0.91	+0.185181	+0.184790	+0.184455
			99263	+28.272	21.30	-0.012	-0.30	-0.014	-0.32	-0.017	-0.32	+0.230174	+0.230828	+0.231378

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS			NO SAO	POSITIONS USED		STAR RESIDUALS						DEPENDENCES		
				s	''	s	''	s	''	s	''			
46	47	48	99268	+26.631	49.06	+0.006	-0.21	+0.011	-0.23	+0.004	-0.16	+0.466196	+0.466107	+0.466013
			99299	+33.412	22.03	-0.007	+0.29	-0.015	+0.31	-0.005	+0.21	+0.088324	+0.087768	+0.087168
			99280	+40.681	41.86	+0.010	-0.37	+0.026	-0.40	+0.014	-0.21	-0.022197	-0.022314	-0.022428
			99263	+28.272	21.30	-0.009	+0.21	-0.042	+0.22	-0.040	-0.12	+0.202871	+0.203218	+0.203581
			99256	+36.822	48.59	+0.001	+0.09	+0.021	+0.10	+0.027	+0.28	+0.264806	+0.265221	+0.265666
49	50	51	99255	+26.059	58.73	-0.014	-0.05	-0.001	+0.14	-0.004	-0.13	-0.176521	-0.176521	-0.176392
			99210	+22.451	33.96	+0.007	-0.26	-0.002	-0.59	-0.003	-0.16	-0.321168	-0.320573	-0.320103
			99217	+55.341	47.85	+0.007	+0.53	+0.004	+0.82	+0.012	+0.47	+0.126640	+0.126840	+0.127169
			99245	+58.669	25.08	-0.028	-0.53	-0.004	-0.46	-0.016	-0.60	+0.693675	+0.693404	+0.693061
			99263	+28.272	21.30	+0.027	+0.30	+0.003	+0.08	+0.012	+0.42	+0.677373	+0.676850	+0.676266
52	53	54	99185	+28.105	58.47	+0.010	-0.68	+0.003	-0.20	-0.002	+0.09	-0.096103	-0.095855	-0.095491
			99187	+13.938	17.46	+0.002	+0.77	+0.006	+0.14	+0.015	-0.02	+0.156106	+0.156264	+0.156406
			99210	+22.451	33.96	-0.047	-0.29	-0.035	+0.24	-0.050	-0.29	-0.077802	-0.077529	-0.077121
			99227	+08.593	19.91	+0.050	+0.59	+0.039	-0.20	+0.058	+0.30	+0.188578	+0.188723	+0.188650
			99245	+58.669	25.08	-0.015	-0.38	-0.013	+0.02	-0.021	-0.08	+0.829221	+0.828397	+0.827555
55	56	57	99234	+47.606	15.84	-0.036	-0.05	-0.030	-0.11	-0.040	+0.30	+0.498580	+0.498182	+0.497739
			99227	+08.593	19.91	+0.032	+0.03	+0.026	+0.07	+0.034	-0.26	+0.379611	+0.379468	+0.379352
			99175	+54.278	17.68	-0.009	-0.10	-0.012	-0.18	-0.014	+0.11	-0.218746	-0.218067	-0.217398
			99187	+13.938	17.46	-0.003	+0.23	+0.008	+0.39	+0.007	-0.07	+0.082176	+0.082301	+0.082430
			99197	+26.089	17.94	+0.016	-0.11	+0.008	-0.17	+0.012	-0.08	+0.258379	+0.258116	+0.257876
58	59	60	99187	+13.938	17.46	+0.005	+0.19	+0.005	-0.12	-0.021	-0.06	+0.344380	+0.344156	+0.343698
			99217	+55.341	47.85	+0.007	+0.29	+0.019	+0.02	+0.022	+0.08	+0.738258	+0.737673	+0.736973
			99210	+22.451	33.96	-0.004	-0.18	-0.012	-0.02	-0.016	-0.06	+0.338040	+0.337927	+0.337957
			99175	+54.278	17.68	+0.010	+0.40	+0.022	-0.06	+0.008	+0.04	-0.465666	-0.464705	-0.463861
			99185	+28.105	58.47	-0.017	-0.70	-0.033	+0.18	+0.007	-0.01	+0.044989	+0.044949	+0.045232
61	62	63	99187	+13.938	17.46	-0.016	-0.10	+0.005	+0.03	-0.005	+0.22	+0.242121	+0.242001	+0.241931
			99217	+55.341	47.85	+0.018	+0.00	+0.038	-0.01	+0.040	+0.07	+0.548307	+0.547776	+0.547241
			99210	+22.451	33.96	-0.014	-0.01	-0.028	+0.01	-0.030	-0.05	+0.375731	+0.375507	+0.375207
			99174	+37.385	36.29	+0.006	-0.04	+0.030	+0.01	+0.026	+0.15	-0.256999	-0.256156	-0.255480
			99185	+28.105	58.47	+0.006	+0.14	-0.045	-0.04	-0.031	-0.39	+0.090840	+0.090871	+0.091102
64	65	66	99175	+54.278	17.68	-0.016	-0.11	-0.012	-0.09	-0.004	+0.04	-0.146632	-0.145669	-0.144677
			99185	+28.105	58.47	-0.011	-0.38	-0.030	-0.21	-0.037	-0.56	+0.074411	+0.074644	+0.074886
			99186	+43.487	20.97	+0.045	+0.68	+0.060	+0.42	+0.053	+0.59	+0.088021	+0.088205	+0.088326
			99210	+22.451	33.96	+0.000	+0.02	+0.002	+0.01	+0.003	+0.04	+0.680624	+0.679851	+0.679135
			99197	+26.089	17.94	-0.019	-0.21	-0.020	-0.14	-0.014	-0.11	+0.303576	+0.302969	+0.302330
67	68	69	99187	+13.938	17.46	-0.001	+0.45	+0.023	+0.68	-0.011	-0.09	+0.611530	+0.611007	+0.610220
			99185	+28.105	58.47	-0.002	-0.44	-0.029	-0.59	+0.006	+0.12	+0.542228	+0.541705	+0.541438
			99175	+54.278	17.68	+0.004	-0.10	+0.005	-0.25	+0.009	-0.03	+0.351122	+0.351062	+0.351042
			99162	+46.577	15.84	+0.000	-0.06	-0.002	-0.09	+0.002	+0.01	-0.354693	-0.354341	-0.353950
			99155	+33.975	21.67	-0.002	+0.15	+0.004	+0.26	-0.006	-0.01	-0.150187	-0.149433	-0.148749
70	71	72	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	+0.123909	+0.124250	+0.124455
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	+0.347687	+0.346615	+0.345628
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	+0.131108	+0.131522	+0.131890
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	+0.257847	+0.257565	+0.257355
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	+0.139450	+0.140047	+0.140671
73	74	75	99299	+33.412	22.03	+0.018	+0.47	+0.022	+0.49	+0.026	+0.44	+0.640648	+0.640140	+0.639528
			99271	+43.332	54.15	+0.021	+0.35	+0.024	+0.42	+0.023	+0.66	+0.046026	+0.046158	+0.046336
			99268	+26.631	49.06	+0.009	+0.40	+0.012	+0.37	+0.018	+0.13	-0.004847	-0.004686	-0.004452
			99285	+58.683	54.55	-0.036	-0.92	-0.043	-0.96	-0.050	-0.91	+0.358034	+0.357675	+0.357320
			99263	+28.272	21.30	-0.012	-0.30	-0.014	-0.32	-0.017	-0.32	-0.039861	-0.039286	-0.038732
76	77	78	99268	+26.631	49.06	+0.006	-0.21	+0.011	-0.23	+0.004	-0.16	+0.393681	+0.393607	+0.393506
			99299	+33.412	22.03	-0.007	+0.29	-0.015	+0.31	-0.005	+0.21	+0.450752	+0.450159	+0.449578
			99280	+40.681	41.86	+0.010	-0.37	+0.026	-0.40	+0.014	-0.21	+0.137413	+0.137311	+0.137173
			99263	+28.272	21.30	-0.009	+0.21	-0.042	+0.22	-0.040	-0.12	+0.023474	+0.023775	+0.024141
			99256	+36.822	48.59	+0.001	+0.09	+0.021	+0.10	+0.027	+0.28	-0.005319	-0.004852	-0.004398
79	80	81	118631	+05.807	21.27	+0.024	-0.30	+0.020	-0.16	+0.023	-0.36	+0.705164	+0.705253	+0.705372
			118644	+43.741	41.47	-0.012	+0.30	-0.011	-0.16	-0.005	+0.27	-0.102861	-0.102194	-0.101889
			118652	+58.786	06.88	-0.034	+0.23	-0.028	+0.57	-0.043	+0.42	+0.170130	+0.170056	+0.170225
			118676	+25.452	29.89	+0.026	-0.35	+0.022	-0.15	+0.025	-0.42	-0.378020	-0.377987	-0.377723
			118686	+14.571	16.75	-0.003	+0.11	-0.003	-0.09	-0.000	+0.09	+0.605588	+0.604872	+0.604015
82	83	84	118606	+59.527	19.83	+0.005	+0.11	+0.008	+0.10	+0.009	+0.08	+0.532997	+0.532652	+0.532291
			118619	+28.183	09.19	-0.014	-0.20	-0.020	-0.18	-0.022	-0.13	-0.418764	-0.417613	-0.416454
			118644	+43.741	41.47	+0.021	-0.06	+0.034	-0.10	+0.033	-0.13	+0.063561	+0.063758	+0.063930
			118649	+29.551	19.00	+0.007	+0.61	+0.005	+0.63	+0.012	+0.55	+0.230414	+0.230237	+0.230112
			118652	+58.786	06.88	-0.020	-0.47	-0.027	-0.45	-0.031	-0.37	+0.591792	+0.590965	+0.590120
85	86	87	118606	+59.527	19.83	+0.008	-0.08	+0.011	-0.14	+0.010	-0.06	+0.272416	+0.272049	+0.271602
			118622	+06.800	15.85	-0.008	+0.31	-0.005	+0.57	-0.006	+0.28	+0.196288	+0.196672	+0.197086
			118619	+28.183	09.19	-0.014	-0.10	-0.024	-0.24	-0.021	-0.14	+0.183170	+0.184116	+0.185104
			118652	+58.786	06.88	-0.022	+0.07	-0.033	+0.07	-0.030	+0.01	+0.182572	+0.181647	+0.180703
			118644	+43.741	41.47	+0.035	-0.19	+0.051	-0.27	+0.047	-0.09	+0.165554	+0.165517	+0.165505
88	89	90	118631	+05.807	21.27	+0.042	-0.76	+0.033	-0.52	+0.042	-0.72	+0.202942	+0.202139	+0.201254
			118621	+32.926	58.44	-0.010	+0.24	-0.016	+0.45	-0.011	+0.47	+0.260772	+0.261176	+0.261577
			118584	+33.137	53.97	-0.006	+0.14	-0.008	+0.19	-0.007	+0.22	+0.099514	+0.099567	+0.099682
			118622	+06.800	15.85	-0.057	+0.98	-0.040	+0.54	-0.056	+0.81	+0.214920	+0.214596	+0.214246
			118603	+35.749	25.40	+0.030	-0.60	+0.031	-0.66	+0.031	-0.78	+0.221852	+0.222523	+0.223241

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS			NO SAO	POSITIONS USED		STAR RESIDUALS						DEPENDENCES		
				s	"	s	"	s	"	s	"			
91	92	93	118631	+05.807	21.27	+0.032	-0.46	+0.013	-0.30	+0.016	-0.37	+0.179032	+0.178324	+0.177680
			118619	+28.183	09.19	-0.019	+0.75	-0.004	+0.48	-0.009	+0.65	+0.334575	+0.334576	+0.334609
			118603	+35.749	25.40	-0.035	-0.28	-0.021	-0.16	-0.019	-0.28	+0.365332	+0.365826	+0.366230
			118579	+55.445	27.00	+0.051	-0.24	+0.026	-0.17	+0.027	-0.16	+0.209839	+0.210413	+0.210927
			118584	+33.137	53.97	-0.029	+0.22	-0.014	+0.15	-0.015	+0.16	-0.088778	-0.089139	-0.089446
94	95	96	118614	+03.821	51.82	-0.010	+0.22	-0.012	+0.34	-0.035	+0.31	+0.418009	+0.418317	+0.418517
			118603	+35.749	25.40	+0.008	-0.20	+0.003	-0.31	+0.035	-0.48	+0.449074	+0.449633	+0.450087
			118585	+45.972	32.11	+0.001	+0.02	+0.011	+0.02	-0.005	+0.29	+0.248231	+0.248677	+0.249189
			118594	+48.102	27.11	-0.003	+0.04	-0.010	+0.07	-0.006	-0.12	-0.102560	-0.102971	-0.103296
			118631	+05.807	21.27	+0.004	-0.07	+0.008	-0.12	+0.011	-0.01	-0.012754	-0.013656	-0.014496
97	98	99	118614	+03.821	51.82	-0.026	+0.41	-0.025	+0.16	-0.027	+0.36	+0.286906	+0.286181	+0.285512
			118604	+39.640	30.31	+0.034	-0.58	+0.033	-0.23	+0.036	-0.52	+0.365613	+0.365761	+0.365861
			118594	+48.102	27.11	+0.022	-0.05	+0.017	-0.01	+0.017	+0.03	-0.077241	-0.077924	-0.078634
			118585	+45.972	32.11	-0.032	-0.14	-0.022	-0.07	-0.021	-0.27	+0.122096	+0.122391	+0.122647
			118582	+14.639	54.28	+0.002	+0.36	-0.003	+0.15	-0.005	+0.41	+0.302625	+0.303591	+0.304613
100	101	102	118597	+04.700	01.04	-0.028	+0.03	-0.028	-0.06	-0.021	-0.04	+0.265838	+0.264763	+0.263715
			118576	+25.662	08.85	-0.041	+0.06	-0.020	+0.58	-0.020	+0.18	+0.437863	+0.438630	+0.439262
			118562	+26.850	42.16	-0.016	+0.02	-0.007	+0.26	-0.008	+0.08	-0.206288	-0.206269	-0.206290
			118582	+14.639	54.28	+0.063	-0.08	+0.059	-0.02	+0.046	+0.03	+0.266974	+0.266747	+0.266514
			118571	+09.836	52.81	+0.022	-0.04	-0.004	-0.76	+0.003	-0.26	+0.235613	+0.236129	+0.236799
103	104	105	118513	+15.860	22.28	+0.049	-0.14	+0.061	-0.21	+0.046	-0.22	-0.165701	-0.165035	-0.164355
			118531	+27.090	50.97	-0.060	+0.28	-0.065	+0.12	-0.055	+0.33	-0.386152	-0.386545	-0.386796
			118554	+58.935	07.80	+0.039	-0.22	+0.038	-0.02	+0.035	-0.24	-0.130887	-0.131474	-0.132213
			118571	+09.836	52.81	+0.015	+0.01	+0.022	-0.13	+0.014	-0.04	+1.069929	+1.069668	+1.069351
			118534	+36.380	28.19	-0.042	+0.08	-0.056	+0.24	-0.040	+0.16	+0.612811	+0.613387	+0.614013
106	107	108	118631	+05.807	21.27	+0.031	-0.96	+0.040	-0.70	+0.036	-0.94	-0.250952	-0.251371	-0.251873
			118644	+43.741	41.47	-0.001	+0.66	+0.004	+0.63	-0.003	+0.88	-0.202064	-0.203163	-0.204128
			118622	+06.800	15.85	-0.046	+0.78	-0.065	+0.41	-0.052	+0.51	+0.188044	+0.188447	+0.188851
			118621	+32.926	58.44	+0.023	-0.12	+0.034	+0.05	+0.025	+0.10	+0.837785	+0.839182	+0.840585
			118642	+31.419	30.18	-0.006	-0.35	-0.012	-0.39	-0.006	-0.55	+0.427187	+0.426904	+0.426565
109	110	111	118619	+28.163	09.19	-0.055	-0.21	-0.060	-0.16	-0.064	-0.14	+0.233308	+0.233448	+0.233592
			118644	+43.741	41.47	+0.027	-0.23	+0.039	-0.26	+0.042	-0.26	-0.051418	-0.051725	-0.052016
			118649	+29.551	19.00	+0.025	+0.41	+0.019	+0.39	+0.020	+0.37	-0.149146	-0.149559	-0.149984
			118673	+56.557	52.04	-0.025	-0.11	-0.027	-0.09	-0.028	-0.08	+0.166749	+0.166580	+0.166392
			118607	+26.608	53.87	+0.028	+0.14	+0.029	+0.12	+0.031	+0.11	+0.800508	+0.801256	+0.802016
112	113	114	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	-0.513390	-0.513089	-0.512878
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	+1.146539	+1.145353	+1.144211
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	-0.314315	-0.313986	-0.313524
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	+0.715206	+0.714957	+0.714609
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	-0.034039	-0.033235	-0.032418
115	116	117	99268	+26.631	49.06	+0.036	+0.58	+0.040	+0.56	+0.050	+0.38	+0.492264	+0.492432	+0.492691
			99285	+58.683	54.55	-0.027	-0.35	-0.040	-0.57	-0.048	-0.32	+0.523452	+0.523404	+0.523316
			99263	+28.272	21.30	-0.017	-0.32	-0.014	-0.18	-0.017	-0.15	-0.320782	-0.320235	-0.319691
			99317	+07.416	58.81	+0.023	+0.45	+0.016	+0.21	+0.021	+0.20	-0.118650	-0.118828	-0.119117
			99316	+05.726	43.50	-0.015	-0.36	-0.003	-0.02	-0.005	-0.10	+0.423716	+0.423227	+0.422800
118	119	120	118435	+12.571	26.05	-0.010	+0.32	-0.010	+0.28	-0.008	+0.38	+0.035740	+0.036109	+0.036458
			118457	+22.934	18.93	+0.006	-0.20	+0.006	-0.18	+0.005	-0.23	+0.337076	+0.336024	+0.335013
			118446	+33.946	47.54	-0.003	+0.01	-0.004	+0.02	-0.000	+0.17	+0.471143	+0.470415	+0.469762
			118434	+12.424	29.68	-0.000	+0.19	+0.002	+0.13	-0.005	-0.12	+0.203079	+0.203314	+0.203508
			118426	+50.486	35.17	+0.007	-0.37	+0.006	-0.26	+0.008	-0.20	-0.047038	-0.045861	-0.044740
121	122	123	118434	+12.424	29.68	+0.008	+0.34	+0.011	+0.44	+0.006	+0.12	+0.487348	+0.486348	+0.485324
			118425	+44.983	04.82	-0.004	-0.21	-0.008	-0.29	+0.000	+0.04	+0.296736	+0.296894	+0.297149
			118408	+51.831	06.85	-0.009	-0.28	-0.006	-0.31	-0.018	-0.47	-0.043350	-0.042160	-0.040991
			118413	+22.099	29.42	+0.015	+0.56	+0.014	+0.66	+0.025	+0.62	-0.009855	-0.009259	-0.008660
			118429	+22.326	31.60	-0.010	-0.40	-0.012	-0.50	-0.013	-0.32	+0.269120	+0.268176	+0.267177
124	125	126	118408	+51.831	06.85	-0.001	-0.07	+0.014	-0.11	+0.006	+0.14	+0.096454	+0.097012	+0.097771
			118426	+50.486	35.17	+0.005	+0.01	+0.005	+0.06	+0.004	-0.09	+0.531555	+0.530561	+0.529604
			118425	+44.983	04.82	-0.006	+0.02	-0.012	-0.04	-0.008	+0.06	+0.441518	+0.440548	+0.439279
			118405	+41.746	58.57	+0.010	-0.10	+0.032	-0.04	+0.019	+0.01	-0.019606	-0.018931	-0.018491
			118401	+23.895	19.70	-0.008	+0.15	-0.039	+0.13	-0.021	-0.12	-0.049921	-0.049190	-0.048163
127	128	129	118395	+05.680	33.49	-0.025	-0.05	-0.020	+0.31	-0.026	+0.31	+0.024863	+0.025195	+0.025447
			118377	+13.823	34.30	+0.010	+0.08	+0.008	-0.07	+0.010	-0.07	+0.022386	+0.023201	+0.024118
			118408	+51.831	06.85	+0.006	-0.29	+0.009	-0.37	+0.008	-0.34	+0.234100	+0.233934	+0.233753
			118413	+22.099	29.42	+0.017	+0.21	+0.012	-0.04	+0.016	-0.05	+0.194415	+0.194071	+0.193683
			118425	+44.983	04.82	-0.008	+0.05	-0.008	+0.17	-0.009	+0.16	+0.524237	+0.523600	+0.523000
130	131	132	118395	+05.680	33.49	-0.008	-0.09	-0.008	-0.02	+0.000	+0.10	+0.134278	+0.134432	+0.134548
			118408	+51.831	06.85	+0.020	+0.11	+0.015	+0.16	-0.004	+0.04	+0.372351	+0.371575	+0.370813
			118401	+23.895	19.70	-0.027	-0.02	-0.014	-0.35	+0.010	-0.39	+0.295461	+0.295137	+0.294877
			118405	+41.746	58.57	+0.008	-0.05	+0.001	+0.16	-0.005	+0.26	+0.327407	+0.326969	+0.326612
			118379	+20.268	43.25	+0.007	+0.05	+0.006	+0.05	-0.001	-0.01	-0.129497	-0.128113	-0.126649
133	134	135	118395	+05.680	33.49	-0.012	-0.43	-0.010	-0.07	-0.021	-0.40	+0.154427	+0.154784	+0.155092
			118408	+51.831	06.85	+0.020	+0.33	+0.016	-0.02	+0.032	+0.32	+0.440006	+0.438881	+0.437815
			118397	+25.582	48.67	-0.030	-0.13	-0.024	+0.15	-0.045	-0.16	+0.327758	+0.327081	+0.326293
			118385	+47.499	46.40	+0.029	-0.25	+0.022	-0.28	+0.041	-0.19	+0.096095	+0.096495	+0.096964
			118379	+20.268	43.25	-0.007	+0.49	-0.005	+0.22	-0.006	+0.43	-0.018286	-0.017241	-0.016165

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS			NO SAO	POSITIONS USED s	POSITIONS USED "	STAR RESIDUALS s	STAR RESIDUALS "	s	"	s	"	DEPENDENCES		
136	137	138	118368	+26.640	04.71	-0.020	-0.50	-0.026	-0.44	-0.021	-0.39	-0.329499	-0.327780	-0.325891
			118379	+20.268	43.25	+0.024	+0.86	+0.024	+0.63	-0.007	+0.74	+0.247840	+0.247855	+0.247631
			118371	+42.842	11.35	-0.005	-0.26	-0.002	-0.16	+0.012	-0.24	+0.394962	+0.394795	+0.394840
			118397	+25.582	48.67	-0.013	-0.34	-0.016	-0.29	-0.011	-0.27	+0.764928	+0.762717	+0.760371
			118384	+45.293	39.32	+0.014	+0.24	+0.020	+0.26	+0.027	+0.15	-0.078230	-0.077587	-0.076950
139	140	141	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	+0.326276	+0.326247	+0.326309
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	-0.444983	-0.446000	-0.447077
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	+0.434437	+0.434796	+0.435132
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	+0.079228	+0.079174	+0.079119
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	+0.605043	+0.605782	+0.606517
142	143	144	99299	+33.412	22.03	+0.018	+0.47	+0.022	+0.49	+0.026	+0.44	+0.108670	+0.107679	+0.106693
			99271	+43.332	54.15	+0.021	+0.35	+0.024	+0.42	+0.023	+0.66	+0.194580	+0.194915	+0.195252
			99268	+26.631	49.06	+0.009	+0.40	+0.012	+0.37	+0.018	+0.13	+0.184966	+0.185403	+0.185815
			99285	+58.683	54.55	-0.036	-0.92	-0.043	-0.96	-0.050	-0.91	+0.062968	+0.062582	+0.062189
			99263	+28.272	21.30	-0.012	-0.30	-0.014	-0.32	-0.017	-0.32	+0.448815	+0.449420	+0.450050
145	146	147	99268	+26.631	49.06	+0.006	-0.21	+0.011	-0.23	+0.004	-0.16	+0.444601	+0.444772	+0.444922
			99299	+33.412	22.03	-0.007	+0.29	-0.015	+0.31	-0.005	+0.21	-0.143697	-0.144509	-0.145320
			99280	+40.681	41.86	+0.010	-0.37	+0.026	-0.40	+0.014	-0.21	-0.076116	-0.076518	-0.076842
			99263	+28.272	21.30	-0.009	+0.21	-0.042	+0.22	-0.040	-0.12	+0.332336	+0.332803	+0.333213
			99256	+36.822	48.59	+0.001	+0.09	+0.021	+0.10	+0.027	+0.28	+0.442877	+0.443451	+0.444028
148	149	150	99255	+26.059	58.73	-0.014	-0.05	-0.001	+0.14	-0.004	-0.13	-0.200399	-0.200539	-0.200621
			99210	+22.451	33.96	+0.007	-0.26	-0.002	-0.59	-0.003	-0.16	-0.082580	-0.081900	-0.081286
			99217	+55.341	47.85	+0.007	+0.53	+0.004	+0.82	+0.012	+0.47	+0.257610	+0.257933	+0.258405
			99245	+58.669	25.08	-0.028	-0.53	-0.004	-0.46	-0.016	-0.60	+0.577598	+0.577329	+0.577041
			99263	+28.272	21.30	+0.027	+0.30	+0.003	+0.08	+0.012	+0.42	+0.447771	+0.447176	+0.446462
151	152	153	99185	+28.105	58.47	+0.010	-0.68	+0.003	-0.20	-0.002	+0.09	+0.188576	+0.189045	+0.189544
			99187	+13.938	17.46	+0.002	+0.77	+0.006	+0.14	+0.015	-0.02	+0.375365	+0.375833	+0.376174
			99210	+22.451	33.96	-0.047	-0.29	-0.035	+0.24	-0.050	-0.29	-0.083168	-0.083152	-0.082888
			99227	+08.593	19.91	+0.050	+0.59	+0.039	-0.20	+0.058	+0.30	+0.017663	+0.017551	+0.017252
			99245	+58.669	25.08	-0.015	-0.38	-0.013	+0.02	-0.021	-0.08	+0.501564	+0.500724	+0.499919
154	155	156	99234	+47.606	15.84	-0.036	-0.05	-0.030	-0.11	-0.040	+0.30	+0.202165	+0.201651	+0.201054
			99227	+08.593	19.91	+0.032	+0.03	+0.026	+0.07	+0.034	-0.26	+0.108281	+0.107932	+0.107578
			99175	+54.278	17.68	-0.009	-0.10	-0.012	-0.18	-0.014	+0.11	+0.109429	+0.110126	+0.110889
			99187	+13.938	17.46	-0.003	+0.23	+0.008	+0.39	+0.007	-0.07	+0.239472	+0.239683	+0.239947
			99197	+26.089	17.94	+0.016	-0.11	+0.008	-0.17	+0.012	-0.08	+0.340652	+0.340609	+0.340532
157	158	159	99187	+13.938	17.46	+0.005	+0.19	+0.005	-0.12	-0.021	-0.06	+0.532585	+0.532697	+0.532711
			99217	+55.341	47.85	+0.007	+0.29	+0.019	+0.02	+0.022	+0.08	+0.321743	+0.321070	+0.320272
			99210	+22.451	33.96	-0.004	-0.18	-0.012	-0.02	-0.016	-0.06	-0.134106	-0.134623	-0.135105
			99175	+54.278	17.68	+0.010	+0.40	+0.022	-0.06	+0.008	+0.04	-0.019582	-0.018606	-0.017720
			99185	+28.105	58.47	-0.017	-0.70	-0.033	+0.18	+0.007	-0.01	+0.299360	+0.299461	+0.299841
160	161	162	99187	+13.938	17.46	-0.016	-0.10	+0.005	+0.03	-0.005	+0.22	+0.554496	+0.554540	+0.554675
			99217	+55.341	47.85	+0.018	+0.00	+0.038	-0.01	+0.040	+0.07	+0.133275	+0.132535	+0.131835
			99210	+22.451	33.96	-0.014	-0.01	-0.028	+0.01	-0.030	-0.05	-0.229119	-0.229667	-0.230263
			99174	+37.385	36.29	+0.006	-0.04	+0.030	+0.01	+0.026	+0.15	+0.131087	+0.131896	+0.132658
			99185	+28.105	58.47	+0.006	+0.14	-0.045	-0.04	-0.031	-0.39	+0.410262	+0.410696	+0.411095
163	164	165	99155	+33.975	21.67	+0.013	+0.20	+0.017	+0.04	+0.010	+0.05	+0.010109	+0.010877	+0.011632
			99175	+54.278	17.68	-0.020	-0.26	-0.024	+0.01	-0.007	+0.07	+0.176198	+0.175979	+0.175773
			99185	+28.105	58.47	-0.025	-0.57	-0.044	-0.31	-0.048	-0.65	+0.273304	+0.272658	+0.272036
			99186	+43.487	20.97	+0.038	+0.73	+0.059	+0.29	+0.052	+0.58	+0.305599	+0.304963	+0.304282
			99162	+46.577	15.84	-0.006	-0.11	-0.009	-0.03	-0.006	-0.06	+0.234790	+0.235524	+0.236277
166	167	168	99186	+43.487	20.97	+0.059	+0.50	+0.051	+0.59	+0.049	+0.66	+0.042595	+0.041912	+0.041227
			99187	+13.938	17.46	-0.033	-0.01	-0.011	+0.03	-0.033	-0.46	-0.046810	-0.047969	-0.049049
			99185	+28.105	58.47	-0.024	-0.62	-0.048	-0.81	-0.012	-0.12	+0.137020	+0.136784	+0.136472
			99175	+54.278	17.68	+0.001	+0.18	+0.012	+0.24	-0.002	-0.04	+0.457794	+0.458950	+0.460069
			99162	+46.577	15.84	-0.003	-0.04	-0.004	-0.05	-0.002	-0.03	+0.409400	+0.410323	+0.411281
169	170	171	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	+0.867894	+0.868061	+0.868321
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	-0.483585	-0.484583	-0.485651
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	+0.620667	+0.621120	+0.621476
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	-0.269798	-0.269981	-0.270091
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	+0.264822	+0.265383	+0.265945
172	173	174	99268	+26.631	49.06	+0.036	+0.58	+0.040	+0.56	+0.050	+0.38	-0.144153	-0.144052	-0.143955
			99285	+58.683	54.55	-0.027	-0.35	-0.040	-0.57	-0.048	-0.32	-0.107102	-0.107241	-0.107279
			99263	+28.272	21.30	-0.017	-0.32	-0.014	-0.18	-0.017	-0.15	+0.574130	+0.574665	+0.575133
			99317	+07.416	58.81	+0.023	+0.45	+0.016	+0.21	+0.021	+0.20	+0.586601	+0.586413	+0.586246
			99316	+05.726	43.50	-0.015	-0.36	-0.003	-0.02	-0.005	-0.10	+0.090525	+0.090214	+0.089855
175	176	177	99268	+26.631	49.06	+0.006	-0.21	+0.011	-0.23	+0.004	-0.16	-0.252099	-0.252209	-0.252283
			99299	+33.412	22.03	-0.007	+0.29	-0.015	+0.31	-0.005	+0.21	+0.333684	+0.333073	+0.332443
			99280	+40.681	41.86	+0.010	-0.37	+0.026	-0.40	+0.014	-0.21	+0.560665	+0.560579	+0.560454
			99263	+28.272	21.30	-0.009	+0.21	-0.042	+0.22	-0.040	-0.12	+0.225243	+0.225555	+0.225873
			99256	+36.822	48.59	+0.001	+0.09	+0.021	+0.10	+0.027	+0.28	+0.132507	+0.133002	+0.133514
178	179	180	99317	+07.416	58.81	-0.009	-0.39	-0.007	-0.49	-0.000	-0.38	+0.563822	+0.563702	+0.563703
			99316	+05.726	43.50	+0.022	+0.23	+0.022	+0.21	+0.018	+0.06	-0.786453	-0.787377	-0.788387
			99299	+33.412	22.03	+0.002	+0.52	-0.001	+0.70	-0.011	+0.60	+0.613590	+0.613937	+0.614216
			99285	+58.683	54.55	-0.039	-0.42	-0.040	-0.39	-0.033	-0.12	-0.093955	-0.093951	-0.093914
			99271	+43.332	54.15	+0.025	+0.06	+0.026	-0.03	+0.026	-0.16	+0.702996	+0.703689	+0.704382

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS			NO SAO	POSITIONS USED		STAR RESIDUALS						DEPENDENCES		
				s	"	s	"	s	"	s	"			
181	182	183	99299	+33.412	22.03	+0.018	+0.47	+0.022	+0.49	+0.026	+0.44	+0.154388	+0.153438	+0.152493
			99271	+43.332	54.15	+0.021	+0.35	+0.024	+0.42	+0.023	+0.66	+0.133507	+0.133841	+0.134190
			99266	+26.631	49.06	+0.009	+0.40	+0.012	+0.37	+0.018	+0.13	+0.094263	+0.094693	+0.095089
			99285	+58.683	54.55	-0.036	-0.92	-0.043	-0.96	-0.050	-0.91	-0.046603	-0.046954	-0.047288
			99263	+28.272	21.30	-0.012	-0.30	-0.014	-0.32	-0.017	-0.32	+0.664445	+0.664983	+0.665516
184	185	186	99268	+26.631	49.06	+0.006	-0.21	+0.011	-0.23	+0.004	-0.16	+0.285715	+0.285895	+0.286107
			99299	+33.412	22.03	-0.007	+0.29	-0.015	+0.31	-0.005	+0.21	-0.207853	-0.208617	-0.209383
			99280	+40.681	41.86	+0.010	-0.37	+0.026	-0.40	+0.014	-0.21	+0.017469	+0.017071	+0.016731
			99263	+28.272	21.30	-0.009	+0.21	-0.042	+0.22	-0.040	-0.12	+0.400997	+0.401442	+0.401796
			99256	+36.822	48.59	+0.001	+0.09	+0.021	+0.10	+0.027	+0.28	+0.503671	+0.504209	+0.504749
187	188	189	99256	+36.822	48.59	+0.011	+0.47	+0.021	+0.38	+0.023	+0.38	+0.219725	+0.219280	+0.218846
			99263	+28.272	21.30	-0.004	-0.24	-0.019	-0.24	-0.013	+0.08	+0.098573	+0.097703	+0.096756
			99250	+02.619	46.06	-0.004	-0.10	+0.005	-0.03	-0.004	-0.39	-0.114554	-0.114849	-0.115062
			99227	+08.593	19.91	+0.002	+0.03	-0.004	-0.00	+0.001	+0.22	+0.188219	+0.189417	+0.190500
			99245	+58.669	25.08	-0.004	-0.16	-0.002	-0.10	-0.007	-0.29	+0.608038	+0.608448	+0.608961
190	191	192	99185	+28.105	58.47	+0.010	-0.68	+0.003	-0.20	-0.002	+0.09	+0.183953	+0.184516	+0.185013
			99187	+13.938	17.46	+0.002	+0.77	+0.006	+0.14	+0.015	-0.02	+0.280832	+0.281292	+0.281636
			99210	+22.451	33.96	-0.047	-0.29	-0.035	+0.24	-0.050	-0.29	+0.056904	+0.056948	+0.057105
			99227	+08.593	19.91	+0.050	+0.59	+0.039	-0.20	+0.058	+0.30	+0.113897	+0.113672	+0.113393
			99245	+58.669	25.08	-0.015	-0.38	-0.013	+0.02	-0.021	-0.08	+0.364414	+0.363572	+0.362853
193	194	195	99234	+47.606	15.84	-0.036	-0.05	-0.030	-0.11	-0.040	+0.30	+0.194424	+0.193906	+0.193410
			99227	+08.593	19.91	+0.032	+0.03	+0.026	+0.07	+0.034	-0.26	+0.177943	+0.177561	+0.177194
			99175	+54.278	17.68	-0.009	-0.10	-0.012	-0.18	-0.014	+0.11	+0.190222	+0.190883	+0.191499
			99187	+13.938	17.46	-0.003	+0.23	+0.008	+0.39	+0.007	-0.07	+0.210308	+0.210541	+0.210773
			99197	+26.089	17.94	+0.016	-0.11	+0.008	-0.17	+0.012	-0.08	+0.227103	+0.227109	+0.227124
196	197	198	99187	+13.938	17.46	+0.005	+0.19	+0.005	-0.12	-0.021	-0.06	+0.406888	+0.407032	+0.407104
			99217	+55.341	47.85	+0.007	+0.29	+0.019	+0.02	+0.022	+0.08	+0.268597	+0.267915	+0.267121
			99210	+22.451	33.96	-0.004	-0.18	-0.012	-0.02	-0.016	-0.06	-0.011996	-0.012560	-0.013108
			99175	+54.278	17.68	+0.010	+0.40	+0.022	-0.06	+0.008	+0.04	+0.071790	+0.072688	+0.073575
			99185	+28.105	58.47	-0.017	-0.70	-0.033	+0.18	+0.007	-0.01	+0.264721	+0.264925	+0.265308
199	200	201	99187	+13.938	17.46	-0.016	-0.10	+0.005	+0.03	-0.005	+0.22	+0.465032	+0.465220	+0.465362
			99217	+55.341	47.85	+0.018	+0.00	+0.038	-0.01	+0.040	+0.07	+0.108131	+0.107395	+0.106679
			99210	+22.451	33.96	-0.014	-0.01	-0.028	+0.01	-0.030	-0.05	-0.147542	-0.148235	-0.148844
			99174	+37.385	36.29	+0.006	-0.04	+0.030	+0.01	+0.026	+0.15	+0.201372	+0.202123	+0.202922
			99185	+28.105	58.47	+0.006	+0.14	-0.045	-0.04	-0.031	-0.39	+0.373007	+0.373497	+0.373882
202	203	204	99155	+33.975	21.67	+0.013	+0.20	+0.017	+0.04	+0.010	+0.05	+0.049914	+0.050793	+0.051578
			99175	+54.276	17.68	-0.020	-0.26	-0.024	+0.01	-0.007	+0.07	+0.197092	+0.196800	+0.196556
			99185	+28.105	58.47	-0.025	-0.57	-0.044	-0.31	-0.048	-0.65	+0.275354	+0.274568	+0.273880
			99186	+43.487	20.97	+0.038	+0.73	+0.059	+0.29	+0.052	+0.58	+0.296058	+0.295279	+0.294551
			99162	+46.577	15.84	-0.006	-0.11	-0.009	-0.03	-0.006	-0.06	+0.181583	+0.182560	+0.183436
205	206	207	99186	+43.487	20.97	+0.059	+0.50	+0.051	+0.59	+0.049	+0.66	+0.027031	+0.026344	+0.025582
			99187	+13.938	17.46	-0.033	-0.01	-0.011	+0.03	-0.033	-0.46	-0.075618	-0.076779	-0.077985
			99185	+28.105	58.47	-0.024	-0.62	-0.048	-0.81	-0.012	-0.12	+0.145469	+0.145186	+0.144827
			99175	+54.278	17.68	+0.001	+0.18	+0.012	+0.24	-0.002	-0.04	+0.523040	+0.524092	+0.525255
			99162	+46.577	15.84	-0.003	-0.04	-0.004	-0.05	-0.002	-0.03	+0.380078	+0.381157	+0.382320
208	209	210	118435	+12.571	26.05	-0.010	+0.32	-0.010	+0.28	-0.008	+0.38	+0.354690	+0.354882	+0.355009
			118457	+22.934	18.93	+0.006	-0.20	+0.006	-0.18	+0.005	-0.23	-0.028460	-0.029684	-0.030893
			118440	+33.946	47.54	-0.003	+0.01	-0.004	+0.02	-0.000	+0.17	-0.070432	-0.070903	-0.071314
			118434	+12.424	29.68	-0.000	+0.19	+0.002	+0.13	-0.005	-0.12	+0.228904	+0.229236	+0.229617
			118426	+50.486	35.17	+0.007	-0.32	+0.006	-0.26	+0.008	-0.20	+0.515297	+0.516469	+0.517581
211	212	213	118434	+12.424	29.68	+0.006	+0.34	+0.011	+0.44	+0.006	+0.12	+0.011575	+0.010749	+0.010010
			118425	+44.983	04.82	-0.004	-0.21	-0.008	-0.29	+0.000	+0.04	+0.244175	+0.244664	+0.245304
			118408	+51.831	06.85	-0.009	-0.28	+0.006	-0.31	-0.018	-0.47	+0.428433	+0.429609	+0.430824
			118413	+22.099	29.42	+0.015	+0.56	+0.014	+0.66	+0.025	+0.62	+0.307383	+0.307777	+0.308038
			118429	+22.326	31.60	-0.010	-0.40	-0.012	-0.50	-0.013	-0.32	+0.008435	+0.007201	+0.005823
214	215	216	118408	+51.831	06.85	-0.001	-0.07	+0.014	-0.11	+0.006	+0.14	+0.492201	+0.492389	+0.492342
			118426	+50.486	35.17	+0.005	+0.01	+0.005	+0.06	+0.004	-0.09	+0.146600	+0.145442	+0.144099
			118425	+44.983	04.82	-0.006	+0.02	-0.012	-0.04	-0.008	+0.06	-0.160706	-0.161362	-0.161859
			118405	+41.746	58.57	+0.010	-0.10	+0.032	-0.04	+0.019	+0.01	+0.153066	+0.153780	+0.154860
			118401	+23.895	19.70	-0.008	+0.15	-0.039	+0.13	-0.021	-0.12	+0.368840	+0.369751	+0.370558
217	218	219	118395	+05.680	33.49	-0.025	-0.05	-0.020	+0.31	-0.026	+0.31	+0.144076	+0.144097	+0.144116
			118377	+13.823	34.30	+0.010	+0.08	+0.008	-0.07	+0.010	-0.07	+0.374262	+0.375438	+0.376455
			118408	+51.831	06.85	+0.006	-0.29	+0.009	-0.37	+0.008	-0.34	+0.163937	+0.163688	+0.163484
			118413	+22.099	29.42	+0.017	+0.21	+0.012	-0.04	+0.016	-0.05	+0.054874	+0.054113	+0.053491
			118425	+44.983	04.82	-0.008	+0.05	-0.008	+0.17	-0.009	+0.16	+0.262851	+0.262664	+0.262454
220	221	222	118395	+05.680	33.49	-0.008	-0.09	-0.008	-0.02	+0.000	+0.10	+0.081779	+0.081329	+0.081004
			118408	+51.831	06.85	+0.020	+0.11	+0.015	+0.16	-0.004	+0.04	-0.000087	-0.001054	-0.001954
			118401	+23.895	19.70	-0.027	-0.02	-0.014	-0.35	+0.010	-0.39	+0.181500	+0.181295	+0.181071
			118405	+41.746	58.57	+0.008	-0.05	+0.001	+0.16	-0.005	+0.26	+0.259519	+0.259717	+0.259782
			118379	+20.268	43.25	+0.007	+0.05	+0.006	+0.05	-0.001	-0.01	+0.477289	+0.478714	+0.480097
223	224	225	118395	+05.680	33.49	-0.012	-0.43	-0.010	-0.07	-0.021	-0.40	+0.106620	+0.106440	+0.106330
			118408	+51.831	06.85	+0.020	+0.33	+0.016	-0.02	+0.032	+0.32	-0.035820	-0.036908	-0.038014
			118397	+25.582	48.67	-0.030	-0.13	-0.024	+0.15	-0.045	-0.16	+0.202391	+0.202186	+0.201923
			118385	+47.499	46.40	+0.029	-0.25	+0.022	-0.28	+0.041	-0.19	+0.366037	+0.366697	+0.367295
			118379	+20.268	43.25	-0.007	+0.49	-0.005	+0.22	-0.006	+0.43	+0.360772	+0.361585	+0.362467

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS	NO SAC	POSITIONS USED s	POSITIONS USED "	STAR RESIDUALS s	"	s	"	s	"	DEPENDENCES		
226 227 228	118368	+26.640	04.71	-0.020	-0.50	-0.026	-0.44	-0.021	-0.39	+0.379362	+0.381381	+0.383429
	118379	+20.268	43.25	+0.024	+0.86	+0.024	+0.63	-0.007	+0.74	+0.175216	+0.175036	+0.174943
	118371	+42.842	11.35	-0.005	-0.26	-0.002	-0.16	+0.012	-0.24	+0.098450	+0.097815	+0.097120
	118397	+25.582	48.67	-0.013	-0.34	-0.016	-0.29	-0.011	-0.27	+0.029713	+0.027530	+0.025277
	118384	+45.293	39.32	+0.014	+0.24	+0.020	+0.26	+0.027	+0.15	+0.317259	+0.318238	+0.319232
229 230 231	118368	+26.640	04.71	-0.022	-0.26	-0.039	-0.21	-0.036	-0.28	+0.390823	+0.390057	+0.389353
	118384	+45.293	39.32	+0.007	+0.11	+0.023	+0.16	+0.025	+0.08	+0.425245	+0.424533	+0.423864
	118329	+38.256	34.36	-0.007	-0.06	+0.002	+0.06	+0.006	-0.10	+0.125398	+0.125373	+0.125321
	118344	+24.545	54.42	+0.059	+0.59	+0.046	+0.04	+0.025	+0.79	+0.090300	+0.090776	+0.091151
	118339	+45.897	02.25	-0.037	-0.37	-0.032	-0.05	-0.019	-0.49	-0.031767	-0.030739	-0.029688
232 233 234	118329	+38.256	34.36	-0.005	-0.08	-0.004	-0.01	-0.004	-0.09	+0.661855	+0.663395	+0.664964
	118344	+24.545	54.42	+0.025	+0.53	+0.022	+0.23	+0.010	+0.64	-0.523304	-0.525278	-0.527240
	118339	+45.897	02.25	-0.028	-0.67	-0.024	-0.37	-0.007	-0.81	-0.249999	-0.251383	-0.252847
	118318	+29.647	31.50	+0.011	+0.16	+0.010	+0.01	+0.009	+0.19	+0.908020	+0.909965	+0.911888
	118331	+44.383	46.82	-0.004	+0.06	-0.003	+0.13	-0.009	+0.07	+0.203429	+0.203300	+0.203234
235 236 237	118631	+05.807	21.27	+0.031	-0.96	+0.040	-0.70	+0.036	-0.94	+0.525494	+0.525296	+0.525204
	118644	+43.741	41.47	-0.001	+0.66	+0.004	+0.63	-0.003	+0.88	+0.196127	+0.195148	+0.194139
	118622	+06.800	15.85	-0.046	+0.78	-0.065	+0.41	-0.052	+0.51	+0.405928	+0.406577	+0.407115
	118621	+32.926	58.44	+0.023	-0.12	+0.034	+0.05	+0.025	+0.10	+0.066400	+0.067511	+0.068646
	118642	+31.419	30.18	-0.006	-0.35	-0.012	-0.39	-0.006	-0.55	-0.193949	-0.194532	-0.195103
238 239 240	118606	+59.527	19.83	+0.005	+0.11	+0.008	+0.10	+0.009	+0.08	+0.399358	+0.399573	+0.399797
	118619	+28.183	09.19	-0.014	-0.20	-0.020	-0.18	-0.022	-0.13	+0.375872	+0.376683	+0.377482
	118644	+43.741	41.47	+0.021	-0.06	+0.034	-0.10	+0.033	-0.13	+0.134431	+0.134360	+0.134305
	118649	+29.551	19.00	+0.007	+0.61	+0.005	+0.63	+0.012	+0.55	+0.073905	+0.073609	+0.073298
	118652	+58.786	06.88	-0.020	-0.47	-0.027	-0.45	-0.031	-0.37	+0.016434	+0.015774	+0.015118
241 242 243	118631	+05.807	21.27	+0.050	-0.39	+0.061	-0.41	+0.062	-0.44	+0.047124	+0.046274	+0.045413
	118622	+06.800	15.85	-0.053	+0.57	-0.062	+0.57	-0.065	+0.61	+0.165269	+0.164883	+0.164483
	118606	+59.527	19.83	-0.036	-0.12	-0.051	-0.06	-0.047	-0.03	+0.131421	+0.131445	+0.131450
	118594	+48.102	27.11	+0.029	+0.22	+0.043	+0.15	+0.039	+0.13	+0.246296	+0.246769	+0.249276
	118597	+04.700	01.04	+0.010	-0.28	+0.008	-0.26	+0.011	-0.27	+0.407890	+0.408630	+0.409378
244 245 246	118597	+04.700	01.04	-0.001	-0.19	-0.001	-0.01	-0.003	-0.17	+0.567504	+0.568856	+0.570172
	118594	+48.102	27.11	+0.007	+0.47	+0.011	+0.31	+0.014	+0.45	+0.386992	+0.387634	+0.388331
	118606	+59.527	19.83	-0.008	-0.44	-0.012	-0.34	-0.014	-0.43	+0.088093	+0.087700	+0.087313
	118622	+06.800	15.85	+0.008	+0.24	+0.014	+0.43	+0.012	+0.26	-0.119925	-0.121082	-0.122260
	118619	+28.183	09.19	-0.007	-0.08	-0.011	-0.38	-0.009	-0.12	+0.077337	+0.076892	+0.076444
247 248 249	118579	+55.445	27.00	-0.004	+0.20	-0.012	+0.24	-0.009	+0.19	+0.573760	+0.574643	+0.575465
	118584	+33.137	53.97	-0.002	-0.12	+0.002	-0.12	+0.001	-0.10	+0.374923	+0.374904	+0.374942
	118622	+06.800	15.85	+0.028	+0.32	+0.017	+0.15	+0.018	+0.17	-0.156917	-0.157674	-0.158422
	118619	+28.183	09.19	-0.046	-0.29	-0.037	+0.01	-0.035	-0.08	-0.036552	-0.036950	-0.037350
	118603	+35.749	25.40	+0.024	-0.11	+0.029	-0.28	+0.026	-0.18	+0.244786	+0.245078	+0.245365
250 251 252	118631	+05.807	21.27	+0.032	-0.46	+0.013	-0.30	+0.016	-0.37	-0.305835	-0.306498	-0.307240
	118619	+28.183	09.19	-0.019	+0.75	-0.004	+0.48	-0.009	+0.65	-0.033945	-0.034220	-0.034426
	118603	+35.749	25.40	-0.035	-0.28	-0.021	-0.16	-0.019	-0.28	+0.250740	+0.250888	+0.251084
	118579	+55.445	27.00	+0.051	-0.24	+0.026	-0.17	+0.027	-0.16	+0.619008	+0.619654	+0.620253
	118584	+33.137	53.97	-0.029	+0.22	-0.014	+0.15	-0.015	+0.16	+0.470032	+0.470176	+0.470331
253 254 255	118566	+17.574	49.77	-0.051	+0.31	-0.041	+0.67	-0.046	+0.56	+0.372403	+0.372761	+0.373191
	118562	+26.850	42.16	+0.035	-0.20	+0.027	-0.44	+0.031	-0.35	+0.589731	+0.590413	+0.591123
	118594	+48.102	27.11	-0.005	+0.14	-0.007	+0.23	-0.010	+0.29	+0.024099	+0.023624	+0.023153
	118585	+45.972	32.11	-0.021	-0.11	-0.010	-0.08	-0.007	-0.26	+0.029169	+0.028829	+0.028494
	118582	+14.639	54.28	+0.043	-0.14	+0.030	-0.38	+0.033	-0.20	-0.015403	-0.015627	-0.015961
256 257 258	118554	+58.935	07.80	+0.003	-0.21	-0.011	-0.07	+0.002	-0.03	+0.745134	+0.745814	+0.746445
	118594	+48.102	27.11	+0.000	+0.10	+0.011	+0.02	-0.001	-0.05	+0.057342	+0.056906	+0.056505
	118597	+04.700	01.04	-0.007	+0.15	-0.009	+0.10	-0.002	+0.24	-0.047372	-0.047688	-0.048028
	118604	+39.640	30.31	+0.007	-0.32	-0.006	-0.14	+0.004	-0.18	-0.153947	-0.154274	-0.154644
	118571	+09.836	52.81	-0.003	+0.27	+0.015	+0.09	-0.003	+0.03	+0.398843	+0.399242	+0.399721
259 260 261	118531	+27.090	50.97	-0.038	+0.39	-0.050	+0.36	-0.054	+0.24	+0.392237	+0.392371	+0.392583
	118562	+26.850	42.16	+0.019	-0.42	+0.033	-0.42	+0.037	-0.29	+0.266611	+0.265939	+0.265472
	118582	+14.639	54.28	+0.019	+0.30	+0.010	+0.34	+0.007	+0.24	-0.058609	-0.059399	-0.060150
	118571	+09.836	52.81	-0.038	-0.24	-0.031	+0.30	-0.028	-0.21	+0.056740	+0.056980	+0.057077
	118529	+17.414	03.95	+0.038	-0.02	+0.039	+0.02	+0.039	+0.02	+0.343020	+0.344109	+0.345019
262 263 264	118513	+15.880	22.28	+0.049	-0.14	+0.061	-0.21	+0.046	-0.22	+0.631592	+0.632455	+0.633309
	118531	+27.090	50.97	-0.060	+0.28	-0.065	+0.12	-0.055	+0.33	+0.413678	+0.413844	+0.413875
	118554	+58.935	07.80	+0.039	-0.22	+0.038	-0.02	+0.035	-0.24	+0.166508	+0.166166	+0.165830
	118571	+09.836	52.81	+0.015	+0.01	+0.022	-0.13	+0.014	-0.04	-0.376978	-0.377901	-0.378659
	118534	+36.380	28.19	-0.042	+0.08	-0.056	+0.24	-0.040	+0.16	+0.165200	+0.165436	+0.165646
265 266 267	118652	+58.786	06.88	+0.005	+0.01	+0.002	-0.10	+0.002	-0.07	-0.000368	+0.001223	+0.002799
	118676	+25.452	29.89	-0.002	+0.10	-0.005	+0.14	+0.004	+0.09	+0.087640	+0.087465	+0.087334
	118686	+14.571	16.75	+0.020	+0.15	+0.002	-0.30	+0.013	-0.24	+0.463007	+0.462559	+0.462048
	118681	+45.288	46.27	-0.031	-0.24	-0.003	+0.47	-0.020	+0.37	+0.323379	+0.323094	+0.322848
	118684	+10.966	49.03	+0.009	-0.03	+0.005	-0.21	+0.001	-0.15	+0.126342	+0.125656	+0.124972
268 269 270	118606	+59.527	19.83	-0.009	+0.32	-0.018	+0.12	-0.010	+0.11	+0.311609	+0.311702	+0.311778
	118619	+28.183	09.19	-0.005	-0.28	-0.005	-0.14	-0.010	-0.11	-0.892444	-0.891501	-0.890518
	118644	+43.741	41.47	+0.037	-0.03	+0.059	+0.10	+0.054	+0.04	+0.258744	+0.258717	+0.258649
	118652	+58.786	06.88	-0.007	-0.31	-0.009	-0.17	-0.014	-0.12	+1.206814	+1.205826	+1.204849
	118677	+56.557	52.04	-0.016	+0.31	-0.028	+0.09	-0.020	+0.09	+0.115278	+0.115257	+0.115243

TABLE 2. STAR RESIDUALS. DEPENDENCES.

OBSERVATIONS	NO SAO	POSITIONS USED		STAR RESIDUALS						DEPENDENCES		
		s	''	s	''	s	''	s	''			
271 272 273	118606	+59.527	19.83	+0.008	-0.08	+0.011	-0.14	+0.010	-0.06	+0.257006	+0.256861	+0.256988
	118622	+06.800	15.85	-0.008	+0.31	-0.005	+0.57	-0.006	+0.28	+0.011869	+0.012238	+0.012606
	118619	+28.183	09.19	-0.014	-0.10	-0.024	-0.24	-0.021	-0.14	-0.240365	-0.239385	-0.238696
	118652	+58.786	06.88	-0.022	+0.07	-0.033	+0.07	-0.030	+0.01	+0.692739	+0.691639	+0.690751
	118644	+43.741	41.47	+0.035	-0.19	+0.051	-0.27	+0.047	-0.09	+0.278750	+0.278647	+0.278350
274 275 276	118631	+05.807	21.27	+0.042	-0.76	+0.033	-0.52	+0.042	-0.72	+0.654283	+0.653242	+0.652302
	118621	+32.926	58.44	-0.010	+0.24	-0.016	+0.45	-0.011	+0.47	+0.070186	+0.070375	+0.070647
	118584	+33.137	53.97	-0.006	+0.14	-0.008	+0.19	-0.007	+0.22	+0.018008	+0.018482	+0.018908
	118622	+06.800	15.85	-0.057	+0.98	-0.040	+0.54	-0.056	+0.81	+0.399011	+0.398656	+0.39815
	118603	+35.749	25.40	+0.030	-0.60	+0.031	-0.66	+0.031	-0.78	-0.141487	-0.140755	-0.14000
277 278 279	118631	+05.807	21.27	+0.032	-0.46	+0.013	-0.30	+0.016	-0.37	+0.533500	+0.532653	+0.53187
	118619	+28.183	09.19	-0.019	+0.75	-0.004	+0.48	-0.009	+0.65	+0.300843	+0.300689	+0.30050
	118603	+35.749	25.40	-0.035	-0.28	-0.021	-0.16	-0.019	-0.28	+0.106133	+0.106437	+0.10675
	118579	+55.445	27.00	+0.051	-0.24	+0.026	-0.17	+0.027	-0.16	-0.073467	-0.072843	-0.07219
	118584	+33.137	53.97	-0.029	+0.22	-0.014	+0.15	-0.015	+0.16	+0.132992	+0.133064	+0.13306
280 281 282	118614	+03.821	51.82	-0.010	+0.22	-0.012	+0.34	-0.035	+0.31	+0.217478	+0.217378	+0.21734
	118603	+35.749	25.40	+0.008	-0.20	+0.003	-0.31	+0.035	-0.48	+0.144726	+0.145069	+0.14551
	118585	+45.972	32.11	+0.001	+0.02	+0.011	+0.02	-0.005	+0.29	+0.086040	+0.086736	+0.08740
	118594	+48.102	27.11	-0.003	+0.04	-0.010	+0.07	-0.006	-0.12	+0.181393	+0.181485	+0.18148
	118631	+05.807	21.27	+0.004	-0.07	+0.008	-0.12	+0.011	-0.01	+0.370363	+0.369332	+0.36825
283 284 285	118614	+03.821	51.82	-0.026	+0.41	-0.025	+0.16	-0.027	+0.36	+0.423629	+0.422439	+0.42124
	118604	+39.640	30.31	+0.034	-0.58	+0.033	-0.23	+0.036	-0.52	+0.178496	+0.178312	+0.17822
	118594	+48.102	27.11	+0.022	-0.05	+0.017	-0.01	+0.017	+0.03	+0.390322	+0.389829	+0.38929
	118585	+45.972	32.11	-0.032	-0.14	-0.022	-0.07	-0.021	-0.27	+0.105041	+0.105636	+0.10620
	118582	+14.639	54.28	+0.002	+0.36	-0.003	+0.15	-0.005	+0.41	-0.097488	-0.096216	-0.09496
286 287 288	118554	+58.935	07.80	+0.003	-0.21	-0.011	-0.07	+0.002	-0.03	+0.020732	+0.021366	+0.02197
	118594	+48.102	27.11	+0.000	+0.10	+0.011	+0.02	-0.001	-0.05	+0.344488	+0.343871	+0.34325
	118597	+04.700	01.04	-0.007	+0.15	-0.009	+0.10	-0.002	+0.24	+0.290499	+0.290162	+0.28985
	118604	+39.640	30.31	+0.007	-0.32	-0.006	-0.14	+0.004	-0.18	+0.286452	+0.286157	+0.28591
	118571	+09.836	52.81	-0.003	+0.27	+0.015	+0.09	-0.003	+0.03	+0.057829	+0.058444	+0.05900
289 290 291	118597	+04.700	01.04	-0.028	+0.03	-0.028	-0.06	-0.021	-0.04	+0.590390	+0.589086	+0.58777
	118576	+75.662	08.85	-0.041	+0.06	-0.020	+0.58	-0.020	+0.18	-0.050130	-0.049610	-0.04898
	118562	+26.850	42.16	-0.016	+0.02	-0.007	+0.26	-0.008	+0.08	+0.201038	+0.201445	+0.20185
	118582	+14.639	54.28	+0.063	-0.08	+0.059	-0.02	+0.046	+0.03	+0.284106	+0.283752	+0.28338
	118571	+09.836	52.81	+0.022	-0.04	-0.004	-0.76	+0.003	-0.26	-0.025405	-0.024674	-0.02403
292 293 294	118513	+15.860	22.28	+0.049	-0.14	+0.061	-0.21	+0.046	-0.22	-0.179804	-0.178772	-0.17779
	118531	+27.090	50.97	-0.060	+0.28	-0.065	+0.12	-0.055	+0.33	+0.113741	+0.113690	+0.11367
	118554	+58.935	07.80	+0.039	-0.22	+0.038	-0.02	+0.035	-0.24	+0.319737	+0.319179	+0.31861
	118571	+09.836	52.81	+0.015	+0.01	+0.022	-0.13	+0.014	-0.04	+0.612009	+0.611188	+0.61032
	118534	+36.380	28.19	-0.042	+0.08	-0.056	+0.24	-0.040	+0.16	+0.134316	+0.134715	+0.13518

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294 ФОТОГРАФСКИХ ПОЛОЖАЈА МАЛИХ ПЛАНЕТА ПОСМАТРАНИХ ГПО ТЕЛЕСКОПОМ ЕВРОПСКЕ ЈУЖНЕ ОПСЕРВАТОРИЈЕ 1987. ГОДИНЕ

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УДК 523. 44
Претходно саопштење

У раду су дати прецизни астрографски положаји малих планета посматраних у периоду фебруар–март 1987. године ГПО телескопом са Европске јужне опсерваторије, Ла Сила, Чиле. У току те мисије откривено је *пет* нових астероида.

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Preliminary report

MULTIDISCIPLINARY STUDIES OF THE VARIATIONS IN THE MEAN GEOGRAPHIC LATITUDES OF BELGRADE*

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SUMMARY: Our research will give a valuable contribution to the examinations of the relationship between the seizmic phenomena and the latitude variations being undoubtedly very important for the city of Belgrade and its surroundings. Such a study is the first of this kind in our country.

1. INTRODUCTION

The first accurate measurements of geographic coordinates in Belgrade at the Astronomical Observatory were done in 1938 for the longitude (λ) and in 1947 for the latitude (φ). For the mentioned purpose instruments for position astronomy-a small transit instrument (2r=100 mm, f=1000 mm) and a zenith–telescope (2r=110 mm, f=1285 mm) – were used. The following values were found

$$\varphi = 44^\circ\, 48'\, 8'' \text{ and } \lambda = -1^h\, 22^m\, 03^s.8.$$

Observations of this kind and the subsequent derivation of the geographic coordinates have been done in Belgrade from the moment of mounting the two instruments till the present time. The obtained results have been utilised in the international cooperation for the purpose of studying the Earth's polar motion and the terrestrial rotation. Since the position of the terrestrial pole is a function of time, the geographic coordinates on the Earth's surface are also variable and consequently one should determine these coordinates „every day" and examine the character of their variations. The investigations performed as yet have shown that the values of the coordinates obtained from observations at a single station besides the influence of the polar motion are affected by a number of other (nonpolar) influences which deteriorate the picture of the changes in the terrestrial pole positions. Among these nonpolar influences, besides the atmospheric ones, the instrumental ones and others, there are also influences due to the geophysical changes of the soil where the station, i. e. the instrument is located, for example vertical and horizontal movements of the soil. Therefore, our research concerning the variations in the geographic coordinates of Belgrade, where our station is situated, requires examinations of Belgrade soil movements. The results obtained from the comparison of the latitude variations derived from the observations in Belgrade and Jozefoslav (Teleki, 1969) have confirmed the existence of such a requirement.

The latitude stations of Belgrade and Warsaw (Jozefoslav) are practically on the same meridian. This means that any polar influences in the differences of their latitudes (instantaneous) are excluded. Therefore, since the latitude differences are not subjected to any changes, the reasons should be looked for in the local factors.

* This paper is dedicated to Dr. Đorđe Teleki, who was the initiator of such multidisciplinary research.

The first analysis of these differences showed that the mean latitude of Belgrade changed significantly, whereas in the case of Warsaw the corresponding value remained almost unchanged. One has looked for an explanation of such a „stormy" latitude curve for Belgrade. A list of great earthquakes having occured in the surroundings of Belgrade has been made and an attempt has been done to find a correlation between the great earthquakes with the changes of the mean latitude. There are no final conclusions as yet.

It is well known that Belgrade is situated within a seismically active region and Warsaw within a seismically stable on. This circumstance enables to judge about the influence of earthquakes on the mean latitude value (and generally on the latitude value) on the basis of a comparison between the two stations (it would be better if there were more of them).

As a consequence a working cooperation of astronomers, seismologists, geodesists, geophysicists and others concerning the present task has developed. This cooperation is realised as a scientific project after which the present article is named.

2. THE AIM OF THE RESEARCH

The central part of Serbia, in the north of which Belgrade is situated, is a region significantly menaced by earthquakes. In the area of Belgrade towards the south there are four seismogenic districts: that of Belgrade and Lazarevac, of Rudnik, Kraljevo and Kopaonik. This is due to the seismotectonic composition of that part of the lithosphere. The seismic energy emitted by the earthquake focus into the extended area of Belgrade is modified due to the existing seismogeological composition and construction within the range of 6–8 MCS (Sikošek, 1987).

The aim of our research is to establish the parameters of detailed seismic regionalization of the extended area of Belgrade on the basis of the data concerning the geological composition, the construction and the determination of the seismotectonic construction and the seismoenergetic capacity of the given area being the base to the study and establishing of the short–term natural phenomenon which predicts a severe earthquake within the extended area of Belgrade.

3. WHAT DOES THE RESEARCH CONTAIN?

The research consists of following the already noticed manifestations of certain phenomena related to the dynamics of the consolidated part of the Earth's outer mantle on the given sector of the terrestrial surface. This includes the astronomical methods of following and studying the latitude variations along the part of the Warsaw–Belgrade meridian and the seismic and seismotectonic methods of following and studying the area between Belgrade and the Western Morava, i. e. the seismological, geomagnetic, gravimetrical and geodetic studies of the extended area of Belgrade.

4. EXPECTED RESULTS

On the basis of the present research one should establish the conditions of organising a corresponding economically justified modern seismic preventive in the extended Belgrade area and answer the question of existing a possibility in the extended area of Belgrade to find a phenomenon which can predict an earthquake. The latitude variations along the part of the Warsaw–Belgrade meridian on this area exist and their existence has been confirmed (Teleki, 1969), as well as in the case of the variations in the seismic activities. Therefore, it is expected to establish mutual dependences of the two phenomena in the framework of this wide research spectrum. It is also expected to establish the variations in other energy fields and the possibility of using the obtained results for the purpose of a short–term prediction of stronger earthquakes in the extended area of Belgrade.

5. WHAT KIND OF RESEARSH HAS BEEN DONE IN THE WORLD AND IN OUR COUNTRY?

The International Association of Seismology and Terrestrial Interior Physics formed in 1969 a special commission whose task is to study the problematics of earthquakes. The same problem was considered by the Union of Geodesy and Geophysics in 1971. From that time a great care has been devoted to the problem in Japan, the USSR, China and the USA. Sufficiently encouraging results have been obtained; the population in menaced areas has been not once evacuated on time. The example of Japan deserves mentioning; in that country the high–speed railway Osaka–Tokio is protected by a system of instrumental following of the short-term phenomena serving as predictors of earthquakes. In this country the activity is carried out as a part of the international project „STUDY OF THE BALKAN PENINSULA SEISMITY" in which except our ones the experts from Rumania, Bulgaria, Greece, Turkey, Albania and also from the USSR, the USA, Japan, France and the Netherlands.

In 1980 began a complex following and studying of the mean latitude variations along the meridian Belgrade–Warsaw within the Belgrade area, as well as the following and studying of the seismic activity. The results of this work performed by investigators from the Astronomical Observatory and the Institute of Seismology of the SRS in Belgrade have been presented at a few scientific meetings in Yugoslavia and abroad (Teleki, The first analysis of these differences showed that the mean latitude of Belgrade changed significantly, whereas in the case of Warsaw the corresponding value remained almost unchanged. One has looked for an explanation of such a „stormy" latitude curve for Belgrade. A list of great earthquakes having occured in the surroundings of Belgrade has been made and an attempt has been done to find a correlation between the great earthquakes with the changes of the mean latitude. There are no final conclusions as yet.

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There has been a programme at the level of Yugoslavia for the surroundings of Skoplje which foresaw that during 1968–1970 would be realised a project enabling existence of a permanent polygon for complex investigations and studies of contemporary movements of the terrestrial crust on a seismically active area. This was an international cooperation programme which besides making a chart of contemporary movements and determining the continental motion foresaw also organising of a net of special experimental polygons all around the world for the purpose of observing the contemporary movements of the terrestrial crust by applying methods of geodesy, geophysics, oceanography and geomorphology.

On the basis of the results presented in the literature and obtained by us at the Astronomical Observatory, the Seismological Institute of the SRS, the Geodesy Department of the Faculty of Civil Engineering, the „Geo" Department of the Faculty of Mine Engineering and Geology, the Geophysical Institute, the „Naftagas" and at the Geomagnetic Institute we try using the values of the measurements to answer the question of the cause of the variations in the Belgrade latitude. In Japan and in China examinations on the seismically unstable bases have been done and it has been discovered that the soil movements are correlated with the variations in the geographic coordinates.

Through this research begun in 1989 and realised as the scientific project after which the present article is named we shall be able to give a partial explanation of the anomalous variations in the mean latitudes of Belgrade. This is of a general interest for the international cooperation of the Belgrade Astronomical Observatory in the study of the terrestrial polar motion. On the other hand our research will give a valuable contribution to the examinations of the relationship between the seismic phenomena and the latitude variations being undoubtedly very important for the city of Belgrade and its surroundings. Such a study is the first of this kind in our country.

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МУЛТИДИСЦИПЛИНАРНА ИЗУЧАВАЊА ПРОМЕНА СРЕДЊЕ ШИРИНЕ БЕОГРАДА

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УДК 528.281
Претходно саопштење

Наша истраживања даће важан допринос испитивању везе између сеизмичких појава и промене географске ширине, која су несумњиво важна за град Београд и његову ширу околину. Таква изучавања су прва ове врсте у нашој земљи.

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Professional paper

OBSERVATIONS À LA LUNETTE ZENITHALE (DE 110 mm) DU SERVICE DE LATITUDE DE L'OBSERVATOIRE DE BELGRADE EN 1983, 1984, 1985

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RÉSUMÉ: On présente les valeurs que quelques données météorologiques prises au cours d'observations.

Les données présentées ici ne sont que la partie non publiée de l'analyse des variations de la latitude de Belgrade en accord avec le programme élargi et proposé par R. Grouitch et Đ. Teleki (Grouitch, Teleki, 1987). Il s'agit, en effet, des données météorologiques, évaluées lors de la réalisation du programme d'observations. Et comme ce travail était un des derniers dans notre longue et fructueuse collaborations avec G. Teleki nous tenons pour notre devoir à le dédier à son mémoire.

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Table 1.

LA LÉGENDE:

Date: Année, mois et date d'observation.
Tz: Température a l'abri météorologique éloigné 50 m de l'instrument.
Ti: Température de l'instrument.
Tv: Température de l'air dans la salle d'observation (valeur moy. des lectures des thermométres sud et nord).
Bo: Lecture du barométre on mm Hg (tenant compte de la temperature de barométre).
GR: Les signes correcpondants pour les sous-groupes introduits par le programme donné par Ševarlić et Teleki (1969) et par Grujić et Teleki (1987)

Table 1

DATE		Tz	Ti	Tv	Bo	GR.
1983						
I	9	2.0C	3.1C	1.9C	753.7	IIa
	9	0.7	2.5	1.2	753.3	IIb
	12	7.2	4.0	4.3	753.2	IIa
	12	5.0	3.5	3.5	752.4	IIb
	18	11.9	7.1	8.4	734.1	Ib
	18	9.4	6.8	7.3	734.1	IIa
	18	6.2	6.2	6.3	734.8	IIb
	25	2.6	2.6	1.9	755.8	IIa
	25	2.9	2.1	1.8	755.2	IIb
II	1	4.4	3.6	3.6	735.1	IIa
	1	4.0	3.3	3.4	732.8	IIb
	3	- 0.1	0.4	- 0.1	745.4	IIa
	3	- 0.8	0.1	- 0.6	744.8	IIb
	25	0.6	0.0	- 0.2	752.6	IIb
	26	4.4	1.8	1.6	744.8	IIb
	26	5.1	1.4	2.2	743.1	IIIa
III	8	9.6	8.4	8.3	745.8	IIb
	8	8.0	7.0	6.9	745.8	IIIa
	10	12.8	10.8	10.8	742.2	IIb
	10	11.6	10.0	9.8	741.9	III-1
	10	11.1	9.4	9.3	741.6	IIIa
	12	0.9	5.9	3.6	750.2	IIb
	12	- 0.4	4.0	1.6	751.0	III-1
	12	- 1.4	2.0	0.2	751.8	IIIa
	15	6.1	6.4	6.1	741.4	IIb
	15	6.1	5.6	5.4	741.4	III-1
	15	5.5	5.0	5.0	740.7	IIIa
	24	11.2	10.6	10.6	733.5	III-1
	24	10.6	10.0	9.8	733.5	IIIa
IV	10	16.2	16.6	15.7	739.7	IIIa
	10	15.4	15.7	14.8	740.5	IIIb
	10	15.3	15.0	14.3	740.5	III-2
	17	9.7	10.0	9.3	740.3	IIIa
	17	9.5	8.6	7.8	740.1	IIIb
	24	18.2	18.4	17.6	735.0	IIIb
V	3	13.6	14.7	13.7	737.9	IIIb
	3	-	16.6	15.1	736.8	III-2
	3	16.6	15.1	13.8	736.8	IV-1
	3	16.6	17.4	16.1	736.8	IVa
	5	10.8	13.6	12.2	741.1	IVa
	10	12.4	13.4	12.6	732.2	IV-1
	10	12.0	13.1	12.0	732.2	IVa
	10	11.8	12.4	11.7	732.1	IVb
	17	21.0	21.5	20.6	738.6	IVa
	17	20.0	20.6	20.0	738.3	IVb

VI	2	22.9	22.6	21.5	741.4	IVa
	2	20.7	21.6	20.4	742.0	IVb
	5	24.4	24.0	23.1	739.8	IVb
	5	24.6	23.0	22.4	739.0	IV-2
	26	22.7	20.8	20.1	740.4	Va
VII	6	23.8	23.3	22.6	741.2	Va
	6	23.0	22.8	22.2	740.8	Vb
	18	25.2	24.8	23.9	741.6	Va
	18	23.0	24.1	23.2	742.0	Vb
	21	12.7	15.2	14.4	743.1	Vb
	26	22.4	23.9	22.7	741.2	Va
	26	20.6	22.6	21.6	741.7	Vb
VIII	10	23.7	23.4	22.7	736.4	Va
	10	21.6	22.6	22.0	736.8	Vb
	15	19.6	20.5	19.0	744.9	Va
	15	15.7	19.2	17.6	745.4	Vb
	23	23.2	24.4	23.2	741.8	Vb
	28	24.2	22.7	21.6	740.8	VIa
	28	23.6	22.1	21.0	-	VIb
	31	20.0	20.9	19.9	741.0	VI-1
IX	1	19.9	21.0	20.1	740.9	Vb
	1	18.6	20.0	18.8	741.3	VI-1
	2	21.0	21.9	21.2	739.3	Vb
	3	23.2	23.2	22.6	736.9	Vb
	6	19.0	19.8	19.1	740.8	Vb
	6	17.9	18.4	17.6	741.0	VI-1
	8	13.9	15.5	14.2	741.5	Vb
	9	22.6	20.4	19.9	738.6	Vb
	9	22.4	19.8	19.6	739.0	VI-1
	10	26.4	24.2	24.0	736.6	Vb
	10	25.3	23.1	22.9	736.4	VI-1
	10	24.6	22.4	22.3	736.4	VIa
	13	15.0	16.6	15.4	743.9	VI-1
	13	13.6	15.7	14.6	744.4	VIa
	14	19.2	18.9	18.5	743.6	Vb
	14	16.6	17.2	16.4	743.2	VI-1
	14	15.4	16.2	15.7	742.9	VIa
	15	20.6	19.0	18.4	739.1	VI-1
	15	18.2	17.9	17.2	738.0	VIb
	16	23.6	22.0	21.6	733.6	VI-1
	21	16.4	16.6	16.0	740.5	VI-1
	21	15.3	15.6	15.1	740.6	VIa
	24	14.6	16.0	14.8	747.1	VI-1
	24	14.0	14.6	13.5	746.5	VIa
	27	14.7	14.4	13.8	747.6	VI-1
	27	14.3	13.8	13.0	747.5	VIa
	27	13.9	13.4	12.8	747.4	VIb
	27	13.9	13.2	13.0	747.4	VI-2
	27	13.3	13.0	12.6	747.2	I-1
	27	13.2	12.6	12.1	746.9	Ia
	28	16.6	16.4	16.1	742.6	VI-1
	28	15.0	15.4	14.8	742.6	VIa

	28	14.3	14.9	14.2	742.7	VIb
	29	15.8	14.9	14.2	742.5	VIa
X	2	7.7	11.0	9.4	749.1	VIb
	2	8.4	9.6	8.4	748.5	VI-2
	4	18.8	17.2	17.3	745.2	VI-1
	4	18.0	16.4	16.2	745.3	VIa
	4	17.5	15.9	15.7	745.5	VIb
	4	17.0	15.6	15.4	745.6	VI-2
	5	18.8	18.9	18.7	743.8	VIa
	5	18.4	18.4	18.4	743.4	VIb
	5	18.2	18.1	18.2	743.4	VI-2
	6	19.6	18.5	18.0	741.5	VIa
	6	17.4	18.0	17.5	742.6	VIb
	6	17.4	17.4	16.8	742.6	VI-2
	7	14.7	16.0	14.9	744.5	VIa
	7	13.6	15.0	13.8	744.0	VIb
	10	12.2	13.0	12.0	741.8	VIa
	10	11.3	12.2	11.3	741.5	VIb
	10	10.8	11.6	11.0	741.5	VI-2
	11	18.2	16.6	16.8	737.2	VIb
	13	10.8	11.0	10.1	747.9	VIa
	13	10.0	10.3	9.6	747.9	VIb
	13	10.0	9.8	9.1	747.9	VI-2
	13	9.8	9.4	8.8	747.9	I-1
	14	12.5	11.4	11.2	746.2	VIb
	14	10.5	11.3	11.0	746.2	VI-2
	14	10.5	10.4	10.0	746.2	I-1
	15	12.8	13.5	12.8	744.1	VIb
	15	12.8	12.0	11.8	743.8	I-1
	16	16.8	15.1	15.0	738.9	VIb
	16	15.3	14.2	13.9	738.9	VI-2
	16	15.7	13.8	13.6	738.3	I-1
	16	15.7	13.6	13.5	738.3	Ia
	22	4.4	7.4	6.8	753.1	I-1
	23	5.2	6.7	6.1	751.1	VIb
	25	4.4	5.6	5.0	747.2	VIb
	28	9.0	9.4	9.9	739.7	VIa
XI	12	0.0	3.4	1.8	746.0	VIa
	12	- 0.4	2.0	0.6	746.3	VIb
	13	- 1.6	0.6	- 0.5	745.5	VIb
	13	- 2.0	- 0.2	- 0.9	745.5	VI-2
	13	- 4.0	- 1.2	- 2.2	746.1	Ia
	16	- 1.4	- 1.0	- 1.4	734.0	I-1
	16	- 1.4	- 1.1	- 1.4	734.1	Ia
	17	0.5	- 0.4	- 0.6	739.6	Ia
	18	- 0.6	- 0.3	- 0.2	741.6	VIa
	18	- 0.7	- 0.8	- 0.6	742.0	VI-2
	18	- 1.7	- 1.2	- 2.0	742.2	I-1
	18	- 1.7	- 1.7	- 2.0	742.2	Ia
	19	- 3.0	- 0.8	- 1.6	745.0	VIa
	19	- 3.9	- 1.8	- 2.8	744.8	VIb
	20	- 2.4	- 1.5	- 1.8	740.1	VIb

	20	- 2.4	- 1.8	- 2.7	740.1	VI-2
	20	- 2.2	- 2.4	- 2.9	738.9	Ia
	24	- 0.4	- 0.4	- 1.0	750.5	Ia
	24	- 1.4	- 1.0	- 1.6	749.7	Ib
	24	- 1.4	- 1.4	- 1.8	749.7	I-2
	25	- 0.1	0.0	- 0.3	746.6	VIa
XII	22	7.0	7.0	6.9	732.8	Ia
	25	14.4	8.8	11.6	742.2	I-1
	25	14.8	9.0	11.4	742.4	Ia
	25	14.8	9.2	11.6	741.8	Ib
	30	6.5	5.2	5.4	745.4	Ia
	30	6.8	5.2	5.5	743.6	Ib
1984						
I	3	11.2	7.7	8.6	737.1	Ia
	3	10.7	7.6	8.5	736.2	Ib
	3	10.1	7.6	8.5	736.2	I-2
	31	4.4	1.9	2.4	737.5	Ib
	31	1.2	1.4	1.5	737.4	I-2
II	2	1.9	1.7	1.8	736.8	IIa
	2	2.1	1.4	1.8	737.3	IIb
	2	2.4	1.3	1.8	738.5	III-1
	5	3.1	3.4	3.0	743.1	IIa
	5	2.9	2.8	2.3	742.7	IIb
III	15	0.6	1.3	0.7	737.8	III-1
	15	0.5	0.8	0.3	737.8	IIIa
	15	0.0	0.4	0.1	737.0	IIIb
	15	0.0	0.1	0.0	737.0	III-2
	19	- 1.2	0.1	- 1.2	742.4	IIIa
	20	- 2.0	- 1.4	- 1.9	741.4	IIIa
	20	- 2.0	- 1.6	- 2.0	740.7	IIIb
	24	5.4	3.6	3.8	737.7	IIIb
	27	11.5	9.5	9.4	738.2	IIIa
	27	11.7	8.8	8.8	739.1	IIIb
	27	11.4	8.6	9.0	739.1	III-2
IV	1	10.6	9.5	9.8	736.1	III-2
	1	9.9	9.2	9.1	735.7	IV-1
	7	12.4	12.1	11.2	733.7	IIIb
	7	11.5	11.3	10.2	733.7	III-2
	14	10.9	11.6	10.8	742.3	IIIb
	14	10.9	10.6	10.0	742.3	III-2
	14	9.4	10.2	9.8	742.4	IV-1
	14	9.4	10.0	9.4	742.4	IVa
	16	12.0	13.2	12.4	734.6	IIIb
	16	12.2	13.0	12.2	734.6	III-2
V	14	12.5	12.0	11.5	735.3	IVa
	14	11.2	11.5	11.2	735.2	IVb
	14	11.2	11.2	11.0	735.2	IV-2
	18	17.2	15.8	16.0	739.2	IVb
	19	19.0	19.0	19.0	732.0	IVa
	19	18.6	18.7	18.6	732.0	IVb
	21	18.9	18.6	17.6	733.5	IV-1
	21	18.3	17.2	16.1	732.7	IVa

	21	16.0	16.5	15.4	734.6	IVb
	21	15.9	16.2	15.2	734.6	IV-2
	24	13.2	16.8	14.8	730.9	IVa
	28	16.4	17.2	16.2	734.0	IVa
	30	13.6	14.6	12.6	736.1	IVb
	31	14.4	16.0	15.0	736.1	IVa
	31	13.8	15.2	14.2	735.1	IVb
VI	2	19.5	17.6	17.4	739.4	IVb
	2	17.6	16.4	16.0	739.4	IV-2
	2	17.6	16.4	16.0	739.4	Va
	3	22.1	19.8	19.0	735.5	IVa
	5	22.0	21.2	20.8	736.6	IVa
	5	21.2	19.9	19.6	737.3	IV-2
	8	14.0	15.2	14.2	732.4	IVb
	8	13.6	14.7	14.0	732.7	IV-2
	10	15.6	16.6	15.5	743.1	IVb
	10	14.2	15.4	14.4	744.0	IV-2
	10	14.6	14.6	13.9	744.0	Va
	10	14.6	14.0	13.5	743.6	Vb
	12	11.4	14.5	12.5	745.6	IV-2
	12	9.9	13.0	11.3	745.7	Va
	12	8.8	11.8	10.7	745.8	Vb
	13	19.0	16.0	14.9	745.1	IVb
	13	13.8	12.9	12.2	746.0	Vb
	14	20.0	19.0	18.5	742.1	IVb
	14	19.6	18.1	17.4	741.7	IV-2
	14	19.2	17.0	16.6	741.6	Va
	14	19.0	16.5	16.0	740.5	Vb
	17	15.4	15.6	14.6	742.8	Va
	18	15.4	16.2	14.9	746.3	Va
	18	13.8	15.2	14.2	746.6	Vb
	20	21.0	20.8	20.5	741.2	IVb
	20	20.2	20.3	19.6	741.2	IV-2
	26	13.2	14.6	13.2	743.6	Va
	26	11.9	13.8	12.7	744.4	Vb
	27	16.2	15.6	15.2	743.0	Va
	27	15.5	15.0	14.8	742.4	Vb
VII	1	17.2	19.1	17.8	743.6	IV-2
	1	16.6	17.6	16.6	743.7	Va
	1	16.9	17.0	16.3	743.2	Vb
	9	19.1	18.2	17.4	741.9	Va
	9	18.6	16.9	16.2	740.6	Vb
	10	20.8	19.2	18.6	743.2	Va
	10	21.8	18.8	18.4	742.5	Vb
	11	23.6	21.6	20.8	742.8	Va
	12	29.0	24.3	24.2	741.8	Va
	12	28.1	23.6	23.7	741.8	Vb
	15	25.8	25.2	24.6	731.1	Va
	23	22.0	22.0	21.4	740.5	Va
	23	22.1	21.2	20.6	740.5	Vb
	25	18.9	20.6	19.3	739.7	Va
	25	18.8	19.8	18.7	739.0	Vb

	30	21.3	20.7	20.2	743.2	Va
	30	20.4	20.2	19.6	743.5	Vb
VIII	2	20.2	21.2	20.6	741.5	Va
	2	19.6	20.8	20.2	741.6	Vb
	3	20.6	22.1	21.3	742.4	Va
	3	19.9	21.4	20.4	742.7	Vb
	18	15.5	17.8	16.4	743.0	VIb
	18	14.2	16.8	15.5	743.0	VI-2
	21	16.8	18.2	17.3	742.4	Vb
	21	16.9	16.4	16.0	742.4	VIa
	21	16.0	15.8	15.5	742.1	VIb
	21	15.0	15.4	15.0	741.8	VI-2
	22	18.5	18.8	17.8	740.8	Vb
	22	18.4	17.9	17.3	740.9	VI-1
	22	18.3	17.2	16.8	740.9	VIa
	22	18.3	16.8	16.3	740.7	VIb
	23	20.0	19.9	19.1	740.5	Vb
	23	19.6	19.2	18.5	740.5	VI-1
	28	12.8	17.2	15.6	744.7	Vb
	28	12.2	15.8	14.4	744.8	VI-1
	29	17.3	17.4	16.7	742.4	Vb
	29	16.8	16.6	16.0	742.4	VI-1
	29	16.6	16.0	15.6	742.5	VIa
	29	16.6	15.6	15.2	742.9	VIb
	30	18.9	18.6	18.1	741.2	Vb
	30	17.8	17.8	17.3	741.2	VI-1
	31	17.9	16.8	16.4	741.3	VIa
	31	16.4	16.2	15.9	741.0	VIb
	31	16.2	15.9	15.6	741.0	VI-2
IX	3	23.6	24.4	21.4	741.8	VIa
	3	22.3	21.0	20.9	741.9	VIb
	3	22.3	20.8	20.6	741.6	VI-2
	4	25.0	22.9	22.9	737.4	[illegible]
	4	25.0	22.2	22.1	737.4	VI-1
	4	25.0	21.6	21.3	737.4	VIa
	4	22.8	21.0	20.5	737.1	VIb
	4	22.7	20.6	20.2	736.8	VI-2
	5	26.0	22.8	22.0	735.3	VI-1
	5	26.0	21.8	21.6	735.3	VIa
	5	22.2	21.3	20.9	735.5	VIb
	6	24.4	22.2	21.6	737.0	VIa
	6	22.1	21.6	20.8	737.7	VIb
	9	14.2	16.5	15.4	737.4	VI-1
	9	15.9	18.0	17.1	738.2	VIa
	9	14.2	15.5	14.4	737.4	VIb
	11	13.8	14.6	14.1	741.5	VI-1
	11	13.4	14.0	13.3	741.7	VIa
	11	13.3	13.5	12.8	741.6	VIb
	11	13.0	13.1	12.6	741.6	VI-2
	12	18.2	16.7	16.2	741.2	VI-1
	13	16.4	16.3	15.8	741.9	VIb
	13	15.8	15.8	15.4	742.0	VI-2
	13	15.2	15.4	15.1	742.0	I-1

	14	22.0	19.5	19.3	738.4	Vb
	14	19.7	17.8	17.4	738.2	VIa
	18	16.2	17.1	16.4	733.9	Vb
	18	15.6	16.4	15.8	734.2	VI-1
	18	15.5	15.8	15.5	734.3	VIa
	18	15.5	15.5	15.2	734.4	VIb
	18	15.2	15.2	15.0	734.5	VI-2
	18	15.0	15.0	14.9	734.6	L-1
	19	20.5	19.2	19.2	734.6	Vb
	25	9.4	12.3	10.8	732.5	VIb
	25	8.6	11.4	10.0	734.8	VI-2
	26	9.8	12.4	11.2	739.8	VIa
	26	9.8	11.2	10.0	740.1	VIb
X	4	14.8	17.1	16.2	736.4	VIb
	4	14.7	16.2	15.4	736.4	VI-2
	4	16.6	15.8	15.0	736.4	I-1
	4	17.7	15.4	15.1	735.8	Ia
	4	17.7	15.2	15.4	735.1	Ib
	9	11.5	12.9	12.4	749.7	VIa
	9	10.6	12.2	11.6	750.3	VIb
	9	10.4	11.8	11.2	750.3	VI-2
	9	10.5	11.4	10.9	750.3	I-1
	9	10.6	11.2	10.6	749.5	Ia
	9	10.2	10.8	10.3	749.5	Ib
	10	14.5	13.1	13.0	748.9	VI-1
	10	13.4	12.6	12.4	749.0	VIa
	13	9.6	12.6	11.2	748.2	VI-2
	13	9.0	11.6	10.4	748.2	I-1
	13	8.2	10.9	9.6	748.3	Ia
	17	7.6	9.0	8.0	746.8	VI-1
	17	6.5	7.5	6.5	746.5	VIa
	17	5.4	6.8	6.0	746.2	VIb
	18	12.6	8.8	9.7	742.0	VI-2
	18	12.9	9.0	9.8	742.3	I-1
	18	13.2	11.4	9.6	742.3	Ia
	19	16.1	12.8	13.4	741.4	VI-1
	19	15.4	12.3	12.8	741.5	VIa
	19	16.2	12.2	12.9	741.6	VIb
	22	13.5	13.1	13.4	745.1	VI-1
	22	12.4	12.0	11.6	745.2	VIa
	22	11.3	11.5	11.0	745.6	VIb
	23	15.0	13.4	13.6	743.0	VIb
	23	15.6	13.2	13.5	743.1	I-1
	23	15.7	13.1	13.2	743.1	Ia
	23	15.5	12.9	13.0	742.9	Ib
	24	13.4	13.4	13.4	743.3	VI-1
	24	14.9	12.8	12.6	743.3	VIa
	24	15.0	12.4	12.3	743.5	VIb
	24	15.0	12.3	12.2	743.5	VI-2
	24	14.6	12.1	12.3	744.3	I-1
	25	15.3	13.0	13.1	742.8	VIa
	25	15.4	12.8	12.9	742.8	VIb

	25	15.4	12.7	12.9	742.8	VI-2
	25	15.6	12.6	12.9	742.6	I-1
	25	15.8	12.5	12.9	742.5	Ia
	27	14.7	14.4	14.5	742.1	VIa
	27	13.9	13.8	13.5	742.4	VIb
	27	12.9	13.2	12.7	742.6	VI-2
XI	1	5.9	7.4	7.3	747.8	Ia
	1	5.4	6.7	6.5	747.7	Ib
	2	5.8	6.0	5.4	746.1	VIa
	2	4.6	5.6	5.0	746.3	VIb
	2	4.6	5.3	5.0	746.3	VI-2
	2	4.7	3.8	4.2	745.9	I-1
	5	4.6	5.2	4.9	739.2	VIa
	5	4.0	5.0	4.5	739.4	VIb
	6	10.1	8.2	8.8	739.4	VIb
	7	13.2	10.2	11.2	739.8	VIa
	7	10.6	9.9	10.0	740.4	VIb
	7	10.3	9.4	9.5	740.4	VI-2
	8	11.0	9.8	9.7	740.6	VIb
	8	9.6	9.5	9.2	740.6	VI-2
	8	9.2	9.1	8.9	740.7	I-1
	8	8.8	8.8	8.8	740.7	Ia
	9	11.0	10.0	10.2	739.5	VIa
	9	9.1	9.5	9.2	740.0	VIb
	9	9.0	9.0	9.0	740.0	VI-2
	9	8.8	9.0	9.0	739.9	I-1
	9	8.1	8.2	8.2	740.1	Ib
	11	2.8	6.6	4.6	747.8	Ia
	11	1.6	5.2	3.3	748.0	Ib
	12	1.2	4.2	3.4	746.1	VIa
	13	- 1.0	1.0	0.2	-	Ia
	14	- 1.5	0.6	- 0.1	740.5	VIb
	14	- 2.4	- 0.9	- 1.4	740.0	I-1
	22	5.6	4.4	4.7	739.8	I-1
	22	5.0	4.3	4.6	739.8	Ia
	22	6.0	4.2	4.6	738.8	Ib
	25	11.1	9.6	10.1	741.8	I-1
	25	12.0	9.4	9.8	741.8	Ia
	25	12.0	9.4	9.8	742.0	Ib
	26	13.8	10.7	11.4	740.5	VIb
	28	3.2	5.0	4.0	750.5	VIb
	28	3.2	4.4	3.2	750.5	VI-2
	28	3.1	3.1	2.4	750.5	I-1
	28	3.3	3.1	2.4	750.5	Ia
	28	2.2	2.9	2.2	749.6	Ib
	28	2.2	2.6	2.1	749.6	I-2
XII	3	3.2	3.2	3.2	745.2	VIb
	3	2.8	2.7	2.5	745.8	I-1
	4	1.6	1.6	1.4	749.7	VIb
	4	0.7	1.2	1.0	750.0	I-1
	5	1.4	1.4	1.3	739.7	VIb
	5	- 0.2	0.4	- 0.2	749.7	VI-2
	12	1.0	1.4	0.8	746.0	VI-2

	12	0.6	0.8	0.2	746.1	I-1
	18	12.0	6.6	9.0	743.4	VI-2
	18	12.2	7.0	9.0	743.7	I-1
	18	11.2	7.0	8.7	743.7	Ib
	19	6.2	5.2	5.5	746.9	I-2
	19	5.8	5.0	5.0	747.2	IIa
	19	5.0	4.6	4.7	746.9	IIb
1985						
I	4	- 6.4	- 4.6	- 5.6	729.8	I-1
	4	- 7.0	- 5.9	- 6.9	730.0	Ia
	4	- 7.6	- 6.3	- 7.2	730.2	Ib
	13	- 8.6	- 7.7	- 7.8	743.4	I-2
	13	- 8.8	- 8.1	- 8.5	743.4	IIa
	17	- 9.5	- 6.5	- 7.1	737.8	IIa
	17	- 9.6	- 7.4	- 8.4	737.2	IIb
	30	0.9	- 0.9	- 1.1	743.9	Ib
	31	0.7	- 0.4	0.0	744.1	I-2
	31	1.4	- 0.6	- 0.1	742.1	IIa
II	4	- 4.3	- 2.8	- 3.7	746.4	I-2
	4	- 4.2	- 3.4	- 4.3	746.4	IIa
III	4	1.6	0.9	1.0	744.1	IIb
	5	8.2	4.4	5.0	747.1	IIb
	5	7.6	4.0	4.8	747.6	III-1
	7	1.2	1.7	1.3	748.1	IIb
	7	0.8	1.2	0.9	748.5	III-1
	13	- 0.4	- 0.2	- 0.5	741.7	III-1
	25	7.6	6.2	6.3	739.4	III-1
	25	7.1	5.7	5.6	739.9	IIIa
	30	9.8	6.8	6.9	741.4	IIIa
	30	9.6	6.6	7.2	741.4	IIIb
	30	9.6	6.6	7.5	741.5	III-2
	31	17.1	11.8	12.8	737.1	III-1
	31	15.9	11.4	12.2	737.1	IIIa
IV	1	11.0	10.4	10.2	741.5	IIIb
	3	14.2	12.8	12.7	743.3	IIIa
	3	11.9	11.7	11.4	743.8	IIIb
	4	15.4	13.2	13.1	739.7	IIIa
	4	15.0	12.7	12.8	739.7	IIIb
	4	15.0	12.4	12.5	739.0	III-2
	5	18.6	15.8	16.1	736.1	IIIa
	5	18.6	15.2	15.4	736.1	IIIb
	5	17.0	14.8	15.0	735.6	III-2
	7	10.0	11.6	10.6	736.4	IIIa
	7	8.8	10.7	10.1	737.1	IIIb
	10	14.6	16.4	15.6	731.8	IIIa
	13	8.2	9.4	8.6	735.4	III-2
	13	8.0	8.8	8.0	734.8	IV-1
	13	7.9	8.4	7.8	734.3	IVa
	20	10.8	10.2	10.1	739.4	IIIb
	20	10.8	9.2	8.8	739.4	III-2
	20	9.2	8.8	8.3	739.7	IV-1

	20	9.1	8.5	8.0	739.7	IVa
	21	11.9	11.0	10.6	740.8	IIIb
	22	14.0	13.2	13.0	736.3	IIIb
	22	13.1	11.8	11.2	736.0	III-2
	23	16.1	14.6	14.6	730.6	IIIb
	23	15.4	13.4	13.2	730.8	III-2
	25	7.8	7.7	6.7	738.6	III-2
V	7	15.0	15.6	14.4	736.0	IV-1
	7	13.2	14.8	13.8	737.2	IVa
	12	18.1	18.3	18.1	738.1	III-2
	12	18.1	17.6	17.1	738.1	IV-1
	12	16.9	17.0	16.6	738.9	IVa
	12	16.9	16.6	16.3	738.9	IVb
	28	21.5	20.4	19.5	737.3	IVa
	29	19.2	20.4	19.4	735.8	IVa
	29	18.2	18.2	17.3	735.6	IV-2
VI	5	20.8	19.4	19.2	739.7	IVa
	5	20.8	19.1	19.0	739.7	IVb
	5	20.5	18.6	18.4	739.5	IV-2
	5	19.7	18.2	18.0	739.3	Va
	6	24.5	22.0	21.9	737.8	IVb
	6	22.8	21.4	21.2	737.6	IV-2
	12	15.4	15.0	14.3	737.4	IV-2
	12	15.1	13.4	13.4	736.3	Vb
	16	12.7	16.4	15.0	738.8	IV-2
	18	12.7	13.6	12.5	737.8	IVb
	18	12.0	12.8	11.9	738.1	IV-2
	18	11.1	11.8	11.5	738.4	Va
	26	19.6	18.2	18.0	742.2	IVb
	26	17.9	17.2	16.5	741.9	IV-2
	26	17.8	15.6	15.0	741.2	Vb
	30	20.0	18.5	17.8	741.3	IV-2
	30	20.2	17.6	17.0	741.9	Va
	30	20.2	17.0	16.6	740.7	Vb
VII	5	16.5	18.6	17.6	739.6	IV-2
	5	15.8	16.6	15.6	739.9	Va
	5	14.9	15.7	15.2	739.3	Vb
	6	15.7	16.6	15.5	741.0	Va
	9	16.2	16.6	15.6	740.3	Va
	9	14.9	15.8	15.0	740.0	Vb
	11	17.8	17.8	16.7	741.6	Va
	11	15.6	16.8	15.8	742.0	Vb
			18.9	18.3	743.2	Va
		[illegible]	18.0	17.5	743.4	Vb
	[illegible]	21.0	20.4	19.5	-	Va
	13	18.6	19.5	18.6	744.0	Vb
	14	21.5	20.2	19.6	743.0	Va
	14	20.6	19.8	19.2	743.1	Vb
	15	22.4	21.7	20.9	742.5	Va
	15	21.6	20.8	20.0	742.7	Vb
	16	23.7	22.3	21.6	742.1	Va
	16	23.0	21.6	21.0	742.0	Vb
	19	22.2	22.7	22.2	737.4	Va

	19	21.3	21.7	20.7	738.0	Vb
	20	25.4	24.0	23.4	737.7	Va
	20	25.0	23.2	22.7	737.6	Vb
	22	17.5	18.6	17.2	746.6	Va
	22	16.4	17.8	16.4	746.5	Vb
	22	15.9	16.8	15.6	746.0	VI-1
	23	20.7	19.9	19.4	743.9	Vb
	23	20.2	19.2	18.6	743.6	VI-1
	25	21.0	21.1	20.4	740.8	Vb
	26	23.5	22.4	21.6	738.4	Va
	27	27.6	23.8	24.0	737.0	Vb
	28	27.2	24.4	23.6	737.2	Va
	30	29.1	26.6	26.2	734.7	Va
VIII	1	19.8	22.4	20.4	738.6	Va
	11	23.3	21.6	20.7	741.8	Vb
	11	22.9	20.7	20.0	742.0	VI-1
	12	22.6	22.0	21.7	742.8	Vb
	14	25.6	24.2	23.7	742.2	Va
	14	23.6	23.0	22.2	742.6	Vb
	17	24.6	23.0	22.6	738.6	VI-1
	17	23.2	22.2	21.8	737.6	VIa
	17	21.9	21.6	21.4	737.2	VIb
	21	20.4	21.6	20.7	743.3	Vb
	21	19.6	20.4	19.2	743.5	VI-1
	23	24.0	22.8	22.2	741.0	VI-1
	23	23.8	22.0	21.4	741.0	VIa
	23	22.8	21.4	21.0	740.6	VIb
	31	19.5	19.7	19.2	740.8	VI-1
	31	18.2	19.2	18.8	741.0	VIa
IX	3	24.0	21.2	21.5	739.1	VIa
	6	15.6	15.8	15.0	742.1	VI-1
	10	12.6	13.7	12.4	745.5	VI-1
	11	15.8	15.1	15.0	745.4	Vb
	11	14.8	14.1	13.6	745.2	VI-1
	12	16.2	15.0	14.6	742.3	VI-1
	12	12.0	14.0	13.1	743.4	VIa
	13	12.9	12.9	12.2	743.0	VI-1
	13	11.4	12.2	11.6	743.0	VIa
	13	10.8	11.0	10.6	742.9	VI-2
	13	10.1	10.6	10.1	742.8	I-1
	19	18.2	17.5	17.4	745.1	VI-1
	19	17.2	16.6	16.4	744.6	VIa
	24	21.6	20.1	19.6	740.1	VI-1
	24	21.3	19.1	19.0	740.4	VIb
	24	21.6	18.9	19.0	740.4	VI-2
X	2	18.6	15.2	15.0	746.9	VIb
	2	19.2	15.0	14.8	746.7	VI-2
	6	18.2	15.9	15.8	742.7	VIb
	6	17.9	15.6	15.4	743.2	VI-2
	21	7.8	9.0	8.9	749.7	VIb
	22	10.5	9.2	9.2	745.7	VI-2
	24	5.5	6.1	5.6	751.6	I-1

	24	3.8	5.6	4.7	751.6	Ia
	25	7.0	6.7	6.2	750.8	VI-1
	25	7.0	5.8	5.3	750.8	VIa
	25	5.8	5.2	5.0	751.1	VIb
	25	5.8	5.0	5.0	751.1	VI-2
XI	7	5.2	4.9	4.5	737.5	VIb
	7	5.2	4.4	4.0	737.5	VI-2
	7	5.2	4.1	3.8	738.0	I-1
	7	5.2	3.8	3.7	738.0	Ia
	9	9.4	8.0	8.2	741.6	VIb
	9	8.6	7.6	7.6	743.8	VI-2
	9	7.9	7.2	7.2	746.1	I-1
	10	15.8	10.2	11.9	73[illegible].6	VIa
	10	15.8	10.2	11.6	734.6	VIb
	10	15.7	10.2	11.6	7[illegible].7	VI-2
	10	15.6	10.0	11.4	732.8	I-1
	10	15.6	10.0	12.0	732.8	Ia
	29	- 0.2	0.4	- 0.5	745.2	VI-2
	29	- 0.2	- 0.2	- 1.0	745.5	I-1
XII	3	10.9	7.5	9.0	746.8	Ib
	3	11.0	7.0	7.8	747.1	I-2
	4	11.7	7.8	9.4	746.6	VIb
	4	11.7	7.8	9.6	746.6	VI-2
	4	11.6	7.8	9.8	746.4	I-1
	4	11.6	7.8	9.3	746.1	Ia
	4	11.6	7.8	8.8	746.1	Ib
	5	13.2	7.8	9.5	741.7	I-1
	5	9.5	7.6	8.4	741.6	Ia
	6	12.2	8.4	10.0	741.3	VI-2
	6	12.2	8.2	9.8	741.3	I-1
	6	10.2	8.2	9.4	742.5	Ia
	6	10.2	8.0	8.9	742.5	Ib
	7	11.9	8.4	9.8	741.4	Ia
	7	11.6	8.3	9.4	741.5	Ib
	8	10.3	7.5	7.8	741.7	VI-2
	8	10.3	7.3	7.4	741.7	I-1
	8	10.3	7.0	7.4	742.3	Ia
	8	10.3	6.8	7.3	742.3	Ib
	9	10.1	7.6	9.0	741.1	I-1
	22	3.6	3.2	3.6	746.4	I-1
	22	3.6	2.6	2.8	746.4	Ia
	22	3.2	2.2	2.6	746.5	Ib
	23	2.0	1.6	2.6	742.0	I-1
	23	1.0	1.0	0.4	742.0	Ia
	23	0.0	0.4	0.2	742.0	Ib

ПОСМАТРАЊА НА ЗЕНИТ ТЕЛЕСКОПУ (110 мм) СЛУЖБЕ ШИРИНЕ АСТРОНОМСКЕ ОПСЕРВАТОРИЈЕ У БЕОГРАДУ У 1983, 1984, 1985

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УДК 521.936/.938

Стручни рад

Дати су метеорлошки подаци мерени у току посматрања у периоду 1983.–1985.

Bull. Obs. Astron. Belgrade N° 143 (1991), 95–99 UDC 521.9–14(083.8)–384
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DIGITAL DESIGNATIONS OF CATALOGUES AND SURVEYS OF STAR POSITIONS

(Series 2)

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(Received: November 26, 1990)

SUMMARY: Digital destignations for further 49 catalogues and surveys of star positions are given. These 49 catalogues were not included in „Bibliography of the Catalogues of Star Positions" (Ševarlić et al. 1978). The designations contain 16 information groups with a total of 50 digits for observational catalogues and 10 groups with the total of 36 digits for other catalogues (derived, fundamental) and surveys.

INTRODUCTION

Following the suggestion which was given at IAU Coll. 48 „Modern Astrometry", Vienna 1978, (Teleki, Ševarlić 1978) we are giving a list of further 49 digital designations of catalogues which were not included in „Bibliography of the Catalogues of Star Positions" (Ševarlić et al. 1978).

The designations contain 16 information groups of 50 digits for observational catalogues and 10 groups of 36 digits for other catalogues (derived, fundamental) and surveys of star positions. These 10 groups are identical with the first 10 groups of informations of the observational catalogues.

Explanations for each individual digit are given in „Digital designations of catalogues and surveys of star positions; Series 1" (Teleki, Pakvor 1989).

As these catalogues were not included in mentioned Bibliography the register number does not depend to any other number and starts from 3001.

The List of institution digits is also published in Series 1.

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3001 4 1 005257 11 301901 2 195001 195001 010

Zverev, M.S.: 1956, Katalog slabyh zvezd (KSZ), chast' 2 (KSZ–2). Glav. Astron. Obs. AN SSSR, Izd. VINITI, Moskva, 117–327.
3002 4 1 010433 11 300301 2 195001 195001 010

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3003 4 1 000488 22 301901 2 195001 195001 010

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3004 4 1 001297 22 300301 2 195001 195001 010

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3005 1 1 000063 01 350360 0 195001 195541 007 05 1 1 3 000000 004

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3007 4 1 002636 11 900901 8 195001 000000 024

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3008 1 1 012876 11 350300 7 195001 195669 023 11 2 1 1 018023 001

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3009 1 1 012120 11 400350 7 195001 195669 023 11 2 1 1 018023 001

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3011 4 1 020437 11 900901 3 190001 000000 021

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3012 1 1 017373 11 500400 7 195001 194259 023 11 2 1 1 029033 001

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ДИГИТАЛНЕ ОЗНАКЕ КАТАЛОГА И ЛИСТА ЗВЕЗДАНИХ ПОЛОЖАЈА

(Серија 2)

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Стручни рад

Дате су дигиталне ознаке за следећих 49 каталога и листа звезданих положаја. Ових 49 каталога нису били укључени у „Библиографију каталога звезданих положаја" (Шеварлић и др. 1978). Ознаке садрже 16 информацијских група са укупно 50 цифара за посматрачке каталоге и 10 група са укупно 36 цифара за остале каталоге (изведене, фундаменталне) и листе.

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SCIENTIFIC AND PROFESSIONAL ACTIVITY OF G. TELEKI

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SUMMARY: In this paper the scientific and professional activity of our distinguished astronomer George Teleki (20.4.1928, Senta – 23.2.1987, Belgrade) is presented and his complete bibliography is given.

In this paper a review of the scientific and professional activity is given, as well as of the work on popularization of astronomy, aimed at offering a better insight into G. Teleki's fruitful scientific career.

In spite of the effort to complete all data concerning G. Teleki's activity, the work on reviewing his rich activity may be, even after this contribution, not comprehensive because his papers are still being published despite of the four-year distance from his death.

His active work in the field of astronomy comprises a wide spectrum of activities: from the scientific production, science popularization and editorial activity to the science organisation in the world and here.

Though at the Astronomical Observatory in Belgrade his research field was in astrometry, his interest was much more ample: he also wrote and published papers belonging to other parts of astronomy and to kindred sciences. His special contribution was in the field of astronomical refraction in which he made his PhD thesis entitled „A Contribution to the Research of Astronomical Refraction and its Anomalies on the Basis of Aerological Measurements carried out in Belgrade".

The contributions published by G. Teleki and about him are divided into:

1. scientific and professional papers;
2. popularization of astronomy;
3. articles about G. Teleki,

followed by a clear division according to the years of publishing.

The list of scientific and professional papers contains 160 references and that of popularization papers 285 ones.

Teleki's published scientific and professional papers can be divided into following groups:

- astronomical instruments and equipment (references I.19, I.20, I.29, I.30, I.42, I.43, I.44, I.45, I.51, I.58, I.61, I.69, I.83, I.87, I.96, I.102, I.104, I.134);
- positional astronomy – catalogues (references I.3, I.4, I.8, I.10, I.17, I.31, I.34, I.38, I.46, I.68, I.82, I.110, I.137, I.139, I.148, I.149, I.150, I.160);
- method and reduction of astronomical observations (references I.6, I.24, I.64, I.66);
- astronomical refraction (references I.33, I.35, I.37, I.47, I.53, I.62, I.71, I.72, I.73, I.74, I.75, I.76, I.77, I.78, I.84, I.86, I.89, I.90, I.91, I.95, I.99, I.100, I.108, I.112, I.113, I.119, I.126, I.131, I.136, I.140, I.144, I.146, I.147);
- latitude determination and variations (references I.1, I.2, I.5, I.6, I.7, I.9, I.11, I.12, I.13, I.14, I.15, I.16, I.18, I.21, I.22, I.23, I.25, I.26, I.27, I.28, I.36, I.39, I.40, I.41, I.50, I.54, I.55, I.57, I.59, I.60, I.63, I.65, I.67, I.70, I.85, I.103, I.109, I.114, I.118, I.122, I.123, I.130, I.151, I.152, I.154);
- dynamics of the Solar System (reference I.145);
- cosmogony (reference I.143);
- geophysics (reference I.133);

- climatology and astroclimate (references I.48, I.49, I.81, I.94, I.120, I.132);
- history of astronomy (references I.105, I.115, I.121, I.135);
- teaching of astronomy (reference I.32);
- development of astronomy (references I.52, I.56, I.79, I.80, I.92, I.98, I.101, I.106, I.111, I.124, I.127, I.128, I.129, I.141, I.142);
- bibliography (references I.88, I.93, I.97, I.107, I.116, I.117, I.125, I.138, I.153, I.155, I.156, I.157, I.158, I.159).

In Fig. 1 a plot of Teleki's scientific and professional papers versus year of publication is presented where n is the number of papers. A few peaks are noticeable in this plot. They belong to the periods: 1968–1970, 1975, 1981–1982, 1985–1987. On the basis of the number of papers published in the last years of his life it is seen that he died in the prime of his creative power.

In Contribution II. Popularization of Astronomy numerous articles published in specialised journals or in the daily press show that a big work was done by G. Teleki also in the field of astronomical popularization by writing in topics of current and public interest. The majority of popularization articles was published between 1975 and 1987 in newspapers „Ekspres Politika" and „Magyar Szó".

The review of the popularization articles presented above does not include a few articles published in the daily press for which the present author has not been able to establish the exact references. Their titles are: „Üstökösök" (7 Nap, 12), „Hósapka a Mars pólusain" (7 Nap, 12), „A Vénuszom nem volt a Holdom sosem lesz élet" (7 Nap, 12), „A világűr rádióállomásai" (7 Nap, 12), „Bolyongás a Tejúton" (7 Nap, 12) and „Van–e bolygó a Plutón tul is?".

As a contribution to the popularization of astronomy G. Teleki prepared for publication a book entitled „Astronomska čitanka" which was planned to be published in 1981 by publishig house „Vuk Karadžić", but has not been published yet.

Here, the present author wishes to mention that G. Teleki contributed to the astronomical science by participating in about 60 direct broadcasts of scientific programmes of Radio–Televisions Belgrade and Novi Sad. He also commented a few scientific programmes and delivered several lectures in the framework of schools of atronomy and popular universities in the whole of Yugoslavia.

There were several interviews with Teleki as a Yugoslav astronomer which finally contributed to popularizing of astronomy through the personality of a diligent and active astronomer.

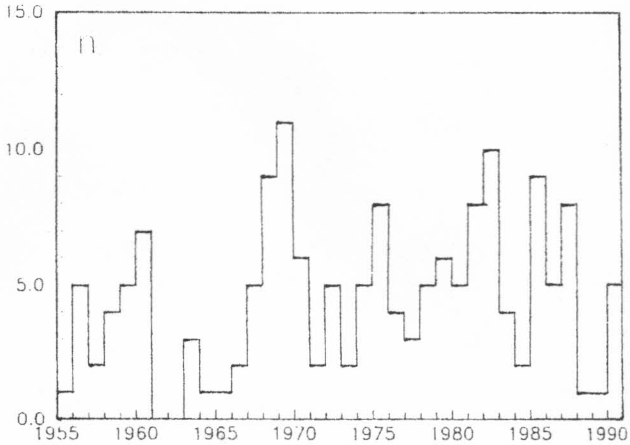

Fig. 1. The scientific and professional papers of G. Teleki versus year of publication.

In Part III. Articles about G. Teleki (list b–In Memoriam) four notes entitled In Memoriam published in Hungarian periodicals are not present because their exact references are unknown.

G. Teleki devoted his time, among others, also to the editorial activity. In the journal „Publikacija Astronomske opservatorije u Beogradu" he was a member of the Editorial Board from No 19 to No 32, as well as for no 34, and its editor–in–chief for No 20, No 26, No 32 and No 34; in the case of „Bulletin de l'Observatoire Astronomique de Belgrade" he was a member of the Editorial Board from No 126 to 133 and its editor–in–chief for No 134, 135 and 136. He was also in the Editorial Board of „Vasiona", the journal of the astronomical society „Rudjer Bošković" from its first issue in 1967 till the first issue for 1987.

G. Teleki's published papers, either the scientific ones or the popularizational ones, will be a source of interest during many years for a large number of specialists, above all astrometrists, as well as for those working in the fields close to astrometry, and in the same way for many people who like astronomy.

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* The reason why one finds in some references the initial G. and in other ones D. is in the translation of Teleki's first name.

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НАУЧНА И СТРУЧНА ДЕЛАТНОСТ Г. ТЕЛЕКИЈА

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