Contrib. Astron. Obs. Skalnaté Pleso **34**, 71 – 80, (2004)

S U P P L E M E N T

Astrometry of minor planets made at the Skalnaté Pleso Observatory in the year 1985

J. Svoreň

Astronomical Institute of the Slovak Academy of Sciences
059 60 Tatranská Lomnica, The Slovak Republic

Received: February 9, 2004

Abstract. The paper presents the results of position photographing of minor planets carried out at the Skalnaté Pleso Observatory in the year 1985.
86 observations of 11 minor planets are given together with the list of reference stars and dependences.

Key words: asteroids – astrometry

1. Introduction

The presented paper is a continuation of our previous papers which gave the results of positional observations of minor planets obtained at the Skalnaté Pleso Observatory and contains the observations made in the year 1985.

The observations were made with a 0.3-m f/5 Zeiss astrograph. The reduction constants of the Skalnaté Pleso astrograph are as follows:
$\lambda = -\ 1^h\ 20^m\ 58.70^s$,
$\varphi = +49^\circ\ 11'\ 20.0''$,
h = 1783 m m.s.l.,
$\rho = 0.99836$ of the equatorial radius of the Earth.
The asteroids were photographed on ORWO plates with ZU 21 emulsion, dimensions 9x12 cm, which roughly correspondents to field of 3°x 4°. The reference stars required to compute positions using Schlesinger's method of dependences, from two independent triangles were selected from the Star Catalog of the Smithsonian Astrophysical Observatory (1966). The differences between independent determination of the equatorial coordinates, given for each position, provide some information about the accuracy of the measuring (but not about the accuracy of the object position). The rectangular coordinates of the reference stars and the minor planets were measured with the aid of instruments for measuring coordinates produced by Zeiss (Koordinatenmessgerät and Ascoremat E-60).

A total of 86 accurate positions of 11 minor planets are given. A list of reference stars and dependences and a list of collaborators are given, together with their share in photographing, measuring and reducing the positions.

2. Conversion from eqn. B1950.0 to eqn. J2000.0

The reference stars were selected from the Smithsonian Astrophysical Observatory Star Catalog(1966). The positions were measured in B1950.0 system and then converted to J2000.0 following the formulas published by System Transition Committee of the IAU Commission 20 (Yeomans, 1990). Conversion from eqn. B1950.0 to eqn. J2000.0 is as follows:

Let α_0 and δ_0 are object's right ascension and declination referred to 1950.0 system. Then the calculated rectangular components of the object's position vector $\mathbf{r_0}$ referred to 1950.0 system are:

$$r_{0x} = cos\alpha_0 \;\; cos\delta_0 \tag{1}$$

$$r_{0y} = sin\alpha_0 \;\; cos\delta_0 \tag{2}$$

$$r_{0z} = sin\delta_0 \tag{3}$$

The astrographic position vector $\mathbf{r_1}$ is formed to remove the effects of elliptical aberration:

$$r_{1x} = r_{0x} - A_x + B \; r_{0x} \tag{4}$$

$$r_{1y} = r_{0y} - A_y + B \; r_{0y} \tag{5}$$

$$r_{1z} = r_{0z} - A_z + B \; r_{0z} \tag{6}$$

where B is a scalar product of the vector transpose to $\mathbf{r_0}$ and the vector $\mathbf{A}$, i.e.

$$B = r_{0x} \; A_x + r_{0y} \; A_y + r_{0z} \; A_z \tag{7}$$

and A_x, A_y, A_z are the rectangular components of the vector $\mathbf{A}$:

$A_x = -1.62557 \times 10^{-6}$
$A_y = -0.31919 \times 10^{-6}$
$A_z = -0.13843 \times 10^{-6}$

If the t is Julian time of the observation, then the Julian centuries from 1950 epoch to the observation time can be calculated as

$$T = (t - 2433282.423) \; / \; 36525 \tag{8}$$

The rectangular components of the object's position vector $\mathbf{r}$ referred to 2000.0 system are:

$$r_x = X_x \; r_{1x} + X_y \; r_{1y} + X_z \; r_{1z} \tag{9}$$

$$r_y = Y_x \; r_{1x} + Y_y \; r_{1y} + Y_z \; r_{1z} \tag{10}$$

$$r_z = Z_x \; r_{1x} + Z_y \; r_{1y} + Z_z \; r_{1z} \tag{11}$$

where $X_x, X_y, ..., Z_z$ are the elements of the rotation matrix (Murray, 1989):

$$X_x = +0.9999256794956877 - 0.0026455262 \times 10^{-6} \; T$$
$$X_y = -0.0111814832204662 - 1.1539918689 \times 10^{-6} \; T$$
$$X_z = -0.0048590038153592 + 2.1111346190 \times 10^{-6} \; T$$
$$Y_x = +0.0111814832391717 + 1.1540628161 \times 10^{-6} \; T$$
$$Y_y = +0.9999374848933135 - 0.0129042997 \times 10^{-6} \; T$$
$$Y_z = -0.0000271625947142 + 0.0236021478 \times 10^{-6} \; T$$
$$Z_x = +0.0048590037723143 - 2.1112979048 \times 10^{-6} \; T$$
$$Z_y = -0.0000271702937440 - 0.0056024448 \times 10^{-6} \; T$$
$$Z_z = +0.9999881946023742 + 0.0102587734 \times 10^{-6} \; T$$

The coordinates α, δ in J2000.0 system are calculated using the expressions:

$$\alpha = arctg\frac{r_y}{r_x} + 90.\ (1 - \frac{r_x}{|r_x|}) \tag{12}$$

$$\delta = arctg\ \frac{r_z}{\sqrt{r_x^2 + r_y^2}} \tag{13}$$

3. Positions of minor planets

The data have been arranged according to serial numbers of minor planets. The individual columns of the table contain the following:
N - ordinal number of observation,
MP - number of minor planet,
Date U.T. - date and time of the middle of the exposure,
$R.A._{2000}$ - right ascension for equinox 2000.0 (in h,m,s),
$Decl._{2000}$ - declination for equinox 2000.0 (in $^\circ, ', ''$),
A - the difference between independent determinations of R.A. in arc seconds,
B - the difference between independent determinations of Decl. in arc seconds.
Notes: 11 - involved with star, 39, 40 - bad seeing, 67, 68 - poor guiding, 73, 74 - dark plate.

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
1	3	1985 Mar.	11.92674	12 38 00.61	+00 27 10.4	0.2	0.4
2	3	1985 Mar.	25.82199	12 27 17.03	+02 33 03.2	0.9	0.8
3	3	1985 Mar.	25.88588	12 27 13.97	+02 33 36.9	0.2	0.8
4	3	1985 Apr.	19.80937	12 09 32.67	+05 39 47.1	0.6	0.2
5	3	1985 Apr.	19.84317	12 09 31.54	+05 39 59.6	0.6	0.6
6	3	1985 Apr.	20.82211	12 08 59.75	+05 45 20.9	0.6	0.8

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
7	3	1985 Apr.	20.87477	12 08 57.99	+05 45 37.9	0.1	0.4
8	3	1985 Apr.	21.84699	12 08 27.57	+05 47 47.2	0.7	0.8
9	3	1985 Apr.	21.86840	12 08 26.86	+05 50 53.6	0.9	0.2
10	3	1985 Apr.	22.82176	12 07 58.01	+05 55 46.3	0.1	0.5
11	3	1985 Apr.	22.87014	12 07 56.50	+05 56 00.5	0.3	0.9
12	3	1985 May	10.86424	12 02 15.36	+06 56 03.6	0.7	0.2
13	3	1985 May	10.92295	12 02 14.80	+06 56 09.8	0.1	0.6
14	4	1985 Apr.	19.85023	14 04 32.08	+00 46 36.3	0.5	0.1
15	4	1985 Apr.	19.87697	14 04 30.58	+00 46 43.4	0.6	0.1
16	4	1985 Apr.	19.90498	14 04 28.98	+00 46 51.3	0.5	0.3
17	4	1985 Apr.	20.90451	14 03 32.42	+00 51 04.4	0.8	0.2
18	4	1985 Apr.	21.85440	14 02 38.61	+00 54 56.2	0.7	0.7
19	4	1985 Apr.	21.88148	14 02 37.04	+00 55 02.4	0.7	0.3
20	4	1985 Apr.	22.82894	14 01 43.24	+00 58 44.8	0.5	0.3
21	4	1985 Apr.	22.87649	14 01 40.48	+00 58 56.4	0.9	0.1
22	4	1985 May	10.87465	13 45 57.70	+01 34 07.9	0.1	0.8
23	4	1985 May	10.93194	13 45 55.09	+01 34 06.4	0.3	0.5
24	6	1985 Apr.	19.82882	06 55 56.02	+19 31 13.8	0.3	0.3
25	6	1985 Apr.	19.86806	06 55 59.40	+19 31 19.7	0.5	0.1
26	6	1985 Apr.	21.79479	06 58 47.01	+19 35 56.4	0.5	0.3
27	6	1985 Apr.	21.82616	06 58 49.74	+19 36 01.9	0.5	0.1
28	6	1985 Apr.	22.80127	07 00 15.23	+19 38 11.1	0.1	0.4
29	6	1985 Apr.	22.85475	07 00 20.05	+19 38 17.6	0.2	0.9
30	11	1985 Aug.	15.85799	21 44 36.49	−16 16 34.7	0.5	0.9
31	11	1985 Aug.	15.89201	21 44 34.69	−16 16 49.1	0.6	0.1
32	11	1985 Aug.	16.85209	21 43 45.21	−16 23 38.9	0.1	0.9
33	11	1985 Sep.	14.81979	21 24 03.12	−18 57 26.9	0.1	0.5
34	11	1985 Sep.	14.85937	21 24 02.19	−18 57 33.8	0.2	0.7
35	11	1985 Sep.	15.81458	21 23 42.59	−19 00 14.2	0.8	0.6
36	11	1985 Sep.	15.85903	21 23 41.65	−19 00 20.6	0.8	0.1
37	11	1985 Oct.	06.74340	21 23 37.47	−19 15 59.0	0.2	0.1
38	11	1985 Oct.	06.78021	21 23 38.11	−19 15 56.6	0.4	0.1
39	39	1985 Apr.	13.96146	10 45 04.01	+11 41 44.5	0.5	0.2
40	39	1985 Apr.	14.01736	10 45 03.06	+11 41 55.1	0.7	0.2
41	39	1985 Apr.	19.80185	10 43 52.32	+11 57 51.6	0.4	0.1
42	39	1985 Apr.	19.83681	10 43 51.96	+11 57 56.3	0.8	0.1
43	39	1985 Apr.	21.81100	10 43 37.73	+12 02 07.6	0.7	0.2
44	39	1985 Apr.	21.84062	10 43 37.53	+12 02 11.4	0.1	0.7
45	39	1985 Apr.	22.83970	10 43 32.25	+12 04 04.6	0.2	0.9
46	39	1985 Apr.	22.88275	10 43 32.05	+12 04 09.2	0.2	0.4
47	40	1985 Apr.	20.83183	07 04 53.18	+24 58 34.5	0.9	0.1
48	40	1985 Apr.	20.88391	07 04 57.74	+24 58 27.3	0.4	0.1
49	40	1985 Apr.	21.80150	07 06 23.57	+24 56 31.7	0.5	0.4
50	40	1985 Apr.	21.83299	07 06 26.49	+24 56 27.5	0.9	0.1
51	40	1985 Apr.	22.81377	07 07 58.77	+24 54 16.3	0.7	0.4
52	40	1985 Apr.	22.86354	07 08 03.53	+24 54 10.0	0.7	0.6

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
53	148	1985 Sep.	15.79861	17 28 17.77	−04 24 07.5	0.9	0.3
54	148	1985 Sep.	15.84687	17 28 19.68	−04 24 34.9	0.4	0.8
55	173	1985 Jan.	29.13958	15 17 56.98	−05 10 58.0	0.2	0.6
56	173	1985 Jan.	29.17604	15 17 58.70	−05 10 56.3	0.1	0.6
57	455	1985 Feb.	25.94444	09 07 33.34	+31 49 59.7	0.1	0.4
58	455	1985 Feb.	26.01319	09 07 29.97	+31 50 07.4	0.5	0.5
59	532	1985 Oct.	21.91528	04 51 31.99	+05 17 31.6	0.8	0.1
60	532	1985 Oct.	21.95590	04 51 31.11	+05 17 26.3	0.7	0.6
61	704	1985 July	19.94028	01 22 28.07	+28 34 59.0	0.2	0.1
62	704	1985 July	19.99236	01 22 30.83	+28 35 35.8	0.1	0.1
63	704	1985 Aug.	14.91667	01 40 42.66	+33 12 01.0	0.4	0.3
64	704	1985 Aug.	14.95556	01 40 43.77	+33 12 23.9	0.4	0.5
65	704	1985 Aug.	15.95417	01 41 09.43	+33 21 50.3	0.8	0.7
66	704	1985 Aug.	15.99097	01 41 10.37	+33 22 11.7	0.7	0.4
67	704	1985 Aug.	16.86078	01 41 31.61	+33 30 17.9	0.1	0.4
68	704	1985 Aug.	16.90314	01 41 32.61	+33 30 41.5	0.6	0.9
69	704	1985 Sep.	14.82917	01 41 58.87	+36 54 25.5	0.6	0.4
70	704	1985 Sep.	14.87396	01 41 57.82	+36 54 36.9	0.5	0.7
71	704	1985 Sep.	15.83125	01 41 34.96	+36 58 27.0	0.1	0.5
72	704	1985 Sep.	15.86771	01 41 34.06	+36 58 35.3	0.2	0.6
73	704	1985 Sep.	20.87922	01 39 10.55	+37 14 40.2	0.5	0.4
74	704	1985 Sep.	20.90986	01 39 09.54	+37 14 45.0	0.2	0.2
75	704	1985 Oct.	04.73126	01 29 40.93	+37 20 59.2	0.5	0.1
76	704	1985 Oct.	04.75833	01 29 39.68	+37 20 56.7	0.2	0.1
77	704	1985 Oct.	05.74653	01 28 51.58	+37 19 04.9	0.1	0.2
78	704	1985 Oct.	05.78404	01 28 49.70	+37 19 01.5	0.2	0.3
79	704	1985 Oct.	06.73056	01 28 02.97	+37 16 56.6	0.1	0.6
80	704	1985 Oct.	06.76991	01 28 00.96	+37 16 51.5	0.1	0.2
81	704	1985 Oct.	16.72593	01 19 26.51	+36 37 31.1	0.2	0.3
82	704	1985 Oct.	16.76262	01 19 24.52	+36 37 18.8	0.6	0.6
83	704	1985 Oct.	17.73449	01 18 33.88	+36 31 49.4	0.2	0.3
84	704	1985 Oct.	17.76574	01 18 32.16	+36 31 38.5	0.1	0.3
85	704	1985 Oct.	20.86840	01 15 51.89	+36 12 17.4	0.2	0.2
86	704	1985 Oct.	20.90880	01 15 49.74	+36 12 01.0	0.3	0.3

4. Reference stars and dependences

The individual columns of the table contain the following:
N - ordinal number of the observation in agreement with the Section 2,
Numbers of reference stars and dependences (SAO catalogue of reference stars is used at all the calculations),
T - the exposure time in minutes.

SUPPLEMENT

N	Numbers of stars and dependences						T
1	119489	.14249	119498	.42564	119517	.43187	
	119491	.24680	138871	.38608	119528	.36712	5
2	119381	.34720	119391	.30128	119443	.35152	
	119347	.16458	119419	.35641	119421	.47901	5
3	119381	.35023	119391	.30761	119443	.34216	
	119347	.17156	119419	.35325	119421	.47519	5
4	119233	.31611	119235	.31533	119271	.36856	
	119222	.43932	119241	.32606	119286	.23462	5
5	119233	.31319	119235	.32282	119271	.36399	
	119222	.44023	119241	.32785	119286	.23192	5
6	119233	.23668	119235	.52698	119271	.23634	
	119222	.47072	119241	.37162	119286	.15766	5
7	119222	.38743	119235	.28561	119271	.32696	
	119233	.43101	119241	.49910	119286	.06989	5
8	119233	.15897	119235	.73390	119271	.10713	
	119222	.50145	119241	.41612	119286	.08243	5
9	119233	.15735	119235	.73833	119271	.10432	
	119222	.50227	119241	.41690	119286	.08083	5
10	119164	.20628	119241	.35376	119252	.43996	
	119172	.27529	119222	.25562	119271	.46909	5
11	119164	.20900	119241	.35352	119252	.43748	
	119172	.27961	119222	.25173	119271	.46866	5
12	119124	.35048	119182	.31655	119232	.33297	
	119148	.36313	119167	.39967	119241	.23720	5
13	119124	.35059	119182	.31813	119232	.33128	
	119148	.36296	119167	.40108	119241	.23596	5
14	120229	.41137	120288	.40882	120294	.17981	
	120224	.47159	120297	.35780	120298	.17061	5
15	120229	.41608	120288	.40570	120294	.17822	
	120224	.47516	120297	.35582	120298	.16902	5
16	120229	.42108	120288	.40241	120294	.17651	
	120224	.47898	120297	.35366	120298	.16736	5
17	120224	.21212	120263	.64042	120286	.14746	
	120229	.35040	120263	.51379	120298	.13581	5
18	120233	.64692	120247	.13950	120288	.21358	
	120224	.47054	120245	.32873	120298	.20073	5
19	120233	.64947	120247	.14300	120288	.20753	
	120224	.47648	120245	.32607	120298	.19745	5

N	Numbers of stars and dependences						T
20	120184	.18666	120247	.22118	120253	.59216	
	120175	.17736	120240	.32348	120263	.49916	5
21	120210	.30676	120247	.56720	120263	.12604	
	120199	.19746	120240	.37881	120253	.42373	5
22	120084	.36618	120109	.25850	120113	.37532	
	120090	.45338	120104	.25224	120120	.29438	5
23	120084	.37671	120109	.25455	120113	.36874	
	120090	.46114	120104	.25601	120120	.28285	5
24	96239	.24194	78875	.15640	96301	.60166	
	96231	.23158	96283	.21899	96300	.54943	5
25	96239	.22707	78875	.15408	96301	.61885	
	96231	.21794	96283	.21282	96300	.56924	5
26	96208	.17356	78932	.32953	96382	.49691	
	78863	.31194	96283	.19670	96396	.49136	5
27	96208	.16737	78932	.33424	96382	.49839	
	78863	.30980	96283	.19159	96396	.49861	5
28	96301	.32727	78980	.26737	96396	.40536	
	96292	.24203	96382	.38824	78986	.36973	5
29	96301	.31125	78980	.27052	96396	.41823	
	96292	.22614	96382	.39326	78986	.38060	5
30	164590	.41415	164621	.23193	164643	.35392	
	164587	.22465	164595	.35791	164651	.41744	5
31	164590	.43371	164621	.28360	164651	.28269	
	164587	.24688	164595	.28232	164643	.47080	5
32	164590	.39827	164615	.26149	164620	.34024	
	164587	.36149	164589	.34027	164643	.29824	4
33	164335	.29343	164362	.31578	164380	.39079	
	164330	.35445	164357	.30240	164398	.34315	5
34	164335	.29670	164362	.31717	164380	.38613	
	164330	.35878	164357	.30003	164398	.34119	5
35	164326	.33847	164362	.32460	164380	.33693	
	164327	.35718	164357	.37641	164398	.26641	5
36	164326	.34168	164362	.32552	164380	.33280	
	164327	.36060	164357	.37528	164398	.26412	5
37	164277	.10735	164357	.19622	164369	.69643	
	164288	.08620	164355	.61231	164380	.30149	5
38	164277	.10568	164357	.19764	164369	.69668	
	164288	.08498	164355	.61180	164380	.30322	5

SUPPLEMENT

N	Numbers of stars and dependences						T
39	99256	.21562	99268	.44908	99299	.33530	
	99263	.19143	99271	.66072	99317	.14785	8
40	99256	.21929	99268	.44764	99299	.33307	
	99263	.19537	99271	.65854	99317	.14609	10
41	99256	.52403	99268	.29510	99299	.18087	
	99245	.28504	99271	.42023	99280	.29473	5
42	99256	.52552	99268	.29438	99299	.18010	
	99245	.28673	99271	.41852	99280	.29475	5
43	99256	.59757	99268	.24809	99299	.15434	
	99245	.35669	99271	.33603	99280	.30728	5
44	99256	.59860	99268	.24754	99299	.15386	
	99245	.35764	99271	.33476	99280	.30760	5
45	99256	.62897	99268	.22514	99299	.14589	
	99245	.38525	99271	.29940	99280	.31535	5
46	99256	.63019	99268	.22418	99299	.14563	
	99245	.38627	99271	.29809	99280	.31564	5
47	78967	.36740	79052	.41488	79116	.21772	
	78941	.32533	79074	.31444	79084	.36023	5
48	78967	.36023	79052	.40878	79116	.23099	
	78941	.31556	79074	.32365	79084	.36079	5
49	78967	.23146	79052	.30486	79116	.46368	
	78941	.14349	79074	.48114	79084	.37537	5
50	78941	.22616	79052	.18772	79116	.58612	
	78967	.17455	79074	.39079	79084	.43466	5
51	79012	.11760	79087	.44175	79114	.44065	
	79014	.16570	79074	.51197	79137	.32233	5
52	79012	.10375	79087	.44257	79114	.45368	
	79014	.15205	79074	.51843	79137	.32952	5
53	141662	.27043	141675	.44592	141717	.28365	
	141651	.18726	141681	.40474	141696	.40800	20
54	141651	.25985	141676	.33867	141715	.40148	
	141662	.36403	141681	.47512	141724	.16085	20
55	140427	.39217	140449	.47982	140451	.12801	
	140429	.41924	140436	.38447	140471	.19629	8
56	140427	.37914	140449	.48508	140451	.13578	
	140429	.41492	140436	.38015	140471	.20493	8
57	61244	.15656	61270	.48751	61291	.35593	
	61249	.20141	61275	.46052	61277	.33807	30

N	Numbers of stars and dependences						T
58	61244	.17335	61270	.48265	61291	.34400	
	61249	.22791	61275	.44916	61277	.32293	30
59	112085	.24326	112185	.36937	112151	.38737	
	112159	.35208	112093	.40088	112209	.24704	5
60	112085	.24605	112185	.36704	112151	.38691	
	112159	.35370	112093	.40230	112209	.24400	5
61	74615	.42299	74626	.14585	74739	.43116	
	74594	.40143	74681	.30105	74757	.29752	8
62	74615	.41318	74626	.15156	74739	.43526	
	74594	.40055	74681	.29604	74757	.30341	8
63	54875	.56487	54918	.20727	54924	.22786	
	54900	.48619	54837	.12707	54904	.38674	6
64	54875	.56037	54918	.20148	54924	.23815	
	54900	.49801	54837	.12166	54904	.38033	6
65	54886	.35875	54897	.35224	54924	.28901	
	54875	.30852	54895	.35586	54932	.33562	4
66	54886	.36205	54897	.34019	54924	.29776	
	54875	.29918	54895	.36455	54932	.33627	4
67	54841	.21404	54903	.38519	54941	.40077	
	54892	.04792	54969	.30196	54875	.65012	6
68	54841	.14111	54903	.57282	54941	.28607	
	54892	.27843	54969	.26658	54875	.45499	6
69	54853	.38219	54930	.34510	54954	.27271	
	54879	.20010	54952	.44779	54862	.35211	5
70	54853	.38537	54930	.34257	54954	.27206	
	54879	.19565	54952	.44582	54862	.35853	5
71	54828	.35182	54930	.35674	54954	.29144	
	54879	.22006	54952	.41481	54853	.36513	5
72	54828	.35389	54930	.35518	54954	.29093	
	54879	.21790	54952	.41320	54853	.36890	5
73	54799	.48870	54901	.21125	54948	.30005	
	54845	.58850	54899	.32288	54936	.08862	5
74	54799	.49003	54901	.21231	54948	.29766	
	54845	.59046	54899	.32462	54936	.08492	5
75	54648	.16291	54693	.27139	54779	.56570	
	54643	.15562	54694	.30566	54782	.53872	5
76	54648	.16466	54693	.27184	54779	.56350	
	54643	.15794	54694	.30520	54782	.53686	5

N	Numbers of stars and dependences						T
77	54648	.23425	54693	.28630	54779	.47945	
	54643	.24770	54694	.28485	54782	.46745	5
78	54648	.23690	54693	.28700	54779	.47610	
	54643	.25106	54694	.28426	54782	.46468	5
79	54648	.30653	54693	.29833	54779	.39514	
	54643	.34031	54694	.26172	54782	.39797	5
80	54648	.30953	54693	.29883	54779	.39164	
	54643	.34409	54694	.26084	54782	.39507	5
81	54519	.40941	54557	.22300	54724	.36759	
	54502	.10505	54564	.34006	54640	.55489	5
82	54519	.41252	54557	.22181	54724	.36567	
	54502	.10621	54564	.34303	54640	.55076	5
83	54483	.26084	54612	.30370	54633	.43546	
	54500	.29899	54614	.30105	54637	.39996	5
84	54483	.26370	54612	.30110	54633	.43520	
	54500	.30162	54614	.30143	54637	.39695	5
85	54483	.53596	54612	.03604	54633	.42800	
	54500	.54305	54614	.36201	54637	.09494	3
86	54483	.53967	54612	.03231	54633	.42802	
	54500	.54628	54614	.36292	54637	.09080	3

5. List of collaborators

Name	Exposures	Measurements	Reductions
G. Červák	34	34	–
L. Kornoš	–	2	27
P. Rychtarčík	52	50	–
J. Svoreň	–	–	59

Acknowledgements. This work was supported, in part, by VEGA - the Slovak Grant Agency for Science (grant No. 4012).

References

Murray, C.A.: 1989, *Astron. Astrophys.* **218**, 325

Smithsonian Astrophysical Observatory Star Catalog. Parts 1-3, Washington, Smithsonian Institution, 1966

Yeomans, D.K.: 1990, *Conversion to FK5/J2000.0*, IAU Commission 20, The letter dated 5 December 1990