Astrometry of minor planets made at the Skalnaté Pleso Observatory in the year 1983

J. Svoreň

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

Abstract. The paper presents the results of position photographing of minor planets carried out at the Skalnaté Pleso Observatory in the year 1983.
114 observations of 12 minor planets are given together with the list of reference stars and dependences.

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 (the last paper of this series: Pittich, Svoreň; 1995) and contains the observations made in the year 1983.

The observations were made with a 0.3-m f/5 Zeiss astrograph. The reduction constants of the Skalnaté Pleso astrograph are as follows:

$\lambda = - 1^h\ 20^m\ 58.70^s$,

$\varphi = +49°\ 11'\ 20.0''$,

$h = 1783$ 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 114 accurate positions of 12 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:

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

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

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 °,′, ″),
A - the difference between independent determinations of R.A. in arc seconds,
B - the difference between independent determinations of Decl. in arc seconds.

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
1	2	1983 Mar.	13.10347	18 52 11.95	+ 9 50 29.8	0.9	0.6
2	2	1983 Mar.	13.14097	18 52 14.09	+ 9 50 48.8	0.5	0.2
3	2	1983 Mar.	14.10694	18 53 08.96	+ 9 59 03.1	0.1	0.6
4	2	1983 Mar.	14.13160	18 53 10.34	+ 9 59 16.0	0.9	0.2
5	2	1983 May	15.95469	19 20 17.58	+19 46 49.8	0.1	0.2
6	2	1983 May	16.90972	19 20 07.16	+19 54 36.1	0.1	0.5
7	2	1983 May	16.93090	19 20 06.88	+19 54 47.9	0.7	0.6
8	2	1983 May	17.90556	19 19 55.09	+20 02 38.1	0.3	0.3

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
9	2	1983 July	15.87257	18 41 37.69	+21 42 24.5	0.1	0.5
10	2	1983 July	15.91076	18 41 35.83	+21 42 10.3	0.1	0.4
11	2	1983 July	16.86840	18 40 51.30	+21 36 14.2	0.6	0.9
12	2	1983 July	16.91146	18 40 49.25	+21 35 58.0	0.2	0.5
13	2	1983 July	18.98924	18 39 14.46	+21 22 15.4	0.3	0.1
14	2	1983 July	19.01181	18 39 13.43	+21 22 05.5	0.4	0.5
15	2	1983 July	31.87465	18 30 39.31	+19 35 49.2	0.5	0.2
16	2	1983 July	31.89965	18 30 38.48	+19 35 34.9	0.1	0.1
17	2	1983 Sep.	1.82882	18 22 17.35	+13 35 40.7	0.4	0.4
18	2	1983 Sep.	1.86632	18 22 17.42	+13 35 12.1	0.5	0.5
19	2	1983 Sep.	29.81227	18 31 27.72	+ 8 15 24.6	0.5	0.2
20	2	1983 Sep.	29.85156	18 31 29.04	+ 8 14 59.8	0.2	0.4
21	2	1983 Oct.	5.73484	18 35 06.80	+ 7 15 02.2	0.7	0.7
22	2	1983 Oct.	5.77049	18 35 08.17	+ 7 14 40.8	0.6	0.1
23	2	1983 Oct.	7.74861	18 36 28.40	+ 6 55 15.5	0.9	0.3
24	2	1983 Oct.	7.79664	18 36 30.31	+ 6 54 48.8	0.8	0.1
25	2	1983 Oct.	10.79711	18 38 38.43	+ 6 26 11.6	0.1	0.1
26	2	1983 Oct.	27.70799	18 52 48.53	+ 4 03 28.6	0.1	0.1
27	2	1983 Oct.	27.72396	18 52 49.47	+ 4 03 21.3	0.3	0.1
28	2	1983 Oct.	28.72639	18 53 45.96	+ 3 55 56.1	0.5	0.2
29	2	1983 Oct.	28.72951	18 53 46.12	+ 3 55 54.4	0.1	0.1
30	2	1983 Oct.	30.77674	18 55 43.49	+ 3 41 06.5	0.1	0.4
31	3	1983 July	19.00278	1 32 22.86	+ 7 51 27.5	0.1	0.9
32	3	1983 July	19.02014	1 32 24.16	+ 7 51 29.9	1.0	0.5
33	3	1983 Aug.	16.01354	2 06 25.80	+ 7 43 45.4	0.4	0.1
34	3	1983 Aug.	16.04271	2 06 27.58	+ 7 43 41.0	0.7	0.5
35	3	1983 Sep.	15.93125	2 26 41.42	+ 4 16 46.4	0.1	0.2
36	3	1983 Sep.	15.96076	2 26 41.79	+ 4 16 28.5	0.2	0.1
37	3	1983 Sep.	29.86794	2 27 11.70	+ 1 33 39.4	0.2	0.8
38	3	1983 Sep.	29.90185	2 27 11.31	+ 1 33 13.0	0.3	0.8
39	3	1983 Oct.	1.89757	2 26 47.24	+ 1 07 22.5	0.7	0.3
40	3	1983 Oct.	1.92188	2 26 46.83	+ 1 07 02.8	0.8	0.2
41	3	1983 Oct.	5.86076	2 25 39.51	+ 0 14 52.0	1.0	0.6
42	3	1983 Oct.	5.88727	2 25 38.93	+ 0 14 30.3	0.9	0.3
43	3	1983 Oct.	7.84572	2 24 56.13	− 0 11 48.4	0.5	0.6
44	3	1983 Oct.	7.86701	2 24 55.56	− 0 12 05.9	0.7	0.5
45	3	1983 Oct.	14.98507	2 21 34.54	− 1 47 43.6	0.4	0.2
46	3	1983 Oct.	14.99653	2 21 34.19	− 1 47 52.4	0.7	0.2
47	3	1983 Nov.	2.88403	2 09 29.77	− 5 28 12.6	0.7	0.1
48	3	1983 Nov.	2.90312	2 09 28.98	− 5 28 22.2	0.7	0.2
49	3	1983 Nov.	7.84919	2 06 20.08	− 6 09 54.6	0.8	0.7
50	3	1983 Nov.	7.88218	2 06 18.82	− 6 10 09.3	0.7	0.6

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
51	3	1983 Nov.	8.80000	2 05 45.83	− 6 16 51.9	0.4	0.2
52	3	1983 Nov.	8.83166	2 05 44.72	− 6 17 06.0	0.5	0.3
53	3	1983 Dec.	3.73403	1 57 50.89	− 7 16 42.1	0.4	0.6
54	3	1983 Dec.	3.77222	1 57 50.95	− 7 16 36.1	0.1	0.4
55	3	1983 Dec.	4.70914	1 57 53.25	− 7 14 25.6	0.1	0.1
56	3	1983 Dec.	4.75914	1 57 53.28	− 7 14 17.8	0.2	0.2
57	3	1983 Dec.	7.73056	1 58 11.56	− 7 05 29.5	0.1	0.4
58	3	1983 Dec.	7.76308	1 58 11.75	− 7 05 21.6	0.2	0.2
59	3	1983 Dec.	8.75347	1 58 21.51	− 7 01 47.8	0.1	0.3
60	3	1983 Dec.	11.67350	1 59 01.00	− 6 49 38.8	0.8	0.5
61	3	1983 Dec.	11.75162	1 59 02.09	− 6 49 16.8	0.2	0.4
62	3	1983 Dec.	29.82066	2 08 40.64	− 4 47 18.5	0.7	0.2
63	3	1983 Dec.	29.88993	2 08 43.83	− 4 46 43.6	0.8	0.3
64	4	1983 Sep.	15.98542	5 35 13.49	+18 02 13.2	0.1	0.2
65	4	1983 Oct.	1.93125	5 47 56.24	+18 01 56.9	0.6	0.1
66	4	1983 Oct.	1.95035	5 47 56.95	+18 01 56.3	0.4	0.2
67	4	1983 Oct.	14.99132	5 54 04.54	+17 59 28.4	0.2	0.2
68	4	1983 Oct.	15.01076	5 54 04.90	+17 59 28.3	0.6	0.6
69	4	1983 Nov.	7.89444	5 52 53.82	+18 00 53.9	0.8	0.8
70	4	1983 Nov.	7.92118	5 52 53.05	+18 00 55.1	0.8	0.7
71	4	1983 Nov.	8.85226	5 52 29.01	+18 01 16.3	0.7	0.9
72	4	1983 Nov.	8.87274	5 52 28.36	+18 01 17.4	0.9	0.2
73	4	1983 Nov.	14.94387	5 49 12.13	+18 04 33.0	0.2	0.7
74	4	1983 Nov.	14.95799	5 49 11.65	+18 04 34.8	0.1	0.4
75	4	1983 Dec.	4.77477	5 31 52.33	+18 23 58.0	0.4	0.6
76	4	1983 Dec.	4.80937	5 31 50.06	+18 24 00.4	0.6	0.1
77	4	1983 Dec.	7.74132	5 28 39.87	+18 27 52.1	0.5	0.9
78	4	1983 Dec.	8.74502	5 27 33.64	+18 29 15.4	0.2	0.1
79	4	1983 Dec.	8.77153	5 27 31.87	+18 29 17.6	0.5	0.5
80	4	1983 Dec.	11.78009	5 24 11.19	+18 33 36.8	0.7	0.3
81	6	1983 Mar.	14.09514	17 46 40.89	− 8 22 35.2	0.1	0.1
82	6	1983 Mar.	14.12431	17 46 42.55	− 8 22 28.8	0.2	0.1
83	11	1983 Jan.	12.79306	5 01 26.87	+18 36 03.9	0.6	0.8
84	11	1983 Jan.	12.88750	5 01 23.60	+18 36 13.8	0.5	0.1
85	18	1983 Mar.	13.76875	10 44 38.79	+11 48 55.2	0.4	0.1
86	18	1983 Mar.	13.78611	10 44 37.92	+11 49 03.7	0.3	0.5
87	18	1983 Mar.	14.90694	10 43 39.99	+11 58 12.8	0.1	0.6
88	18	1983 Mar.	14.92361	10 43 39.19	+11 58 20.4	0.3	0.4
89	39	1983 Nov.	7.90313	5 23 23.89	+ 7 35 14.8	0.3	0.1
90	39	1983 Nov.	7.93160	5 23 23.03	+ 7 35 07.3	0.1	0.3
91	39	1983 Nov.	8.83947	5 22 55.80	+ 7 31 19.6	0.6	0.5
92	39	1983 Nov.	8.86238	5 22 55.03	+ 7 31 12.1	0.6	0.2

N	MP	Date U.T.		$R.A._{2000}$	$Decl._{2000}$	A	B
93	39	1983 Nov.	14.93275	5 19 20.58	+ 7 07 26.7	0.9	0.4
94	39	1983 Nov.	14.95012	5 19 19.93	+ 7 07 22.3	0.1	0.6
95	39	1983 Dec.	27.75000	4 43 37.90	+ 6 38 52.9	0.8	0.2
96	39	1983 Dec.	29.83530	4 42 13.75	+ 6 44 46.1	1.0	0.5
97	39	1983 Dec.	29.88206	4 42 11.90	+ 6 44 54.0	0.8	0.1
98	148	1983 Mar.	12.76389	7 06 35.54	+11 27 58.0	0.9	0.3
99	148	1983 Mar.	12.78333	7 06 35.97	+11 28 09.2	0.1	0.2
100	148	1983 Mar.	13.75833	7 06 58.09	+11 38 20.2	0.2	0.1
101	148	1983 Mar.	13.77813	7 06 58.46	+11 38 32.8	0.8	0.1
102	247	1983 Sep.	8.95590	3 24 54.94	+36 46 44.6	0.3	0.8
103	247	1983 Sep.	9.00000	3 24 56.88	+36 47 39.0	0.1	0.1
104	247	1983 Sep.	9.02454	3 24 57.91	+36 48 09.5	1.1	0.8
105	275	1983 Dec.	7.75301	4 36 02.65	+15 22 26.0	0.4	0.1
106	275	1983 Dec.	7.79097	4 36 00.43	+15 22 22.1	0.1	0.2
107	275	1983 Dec.	8.69618	4 35 08.45	+15 21 26.1	0.8	0.4
108	275	1983 Dec.	8.76215	4 35 04.60	+15 21 22.2	0.2	0.2
109	532	1983 Mar.	14.11597	18 13 23.46	−13 00 06.0	0.1	0.7
110	532	1983 Mar.	14.14063	18 13 25.12	−13 00 05.9	0.2	0.1
111	532	1983 Aug.	1.85868	17 51 18.10	−20 52 45.3	0.1	0.1
112	532	1983 Aug.	1.88715	17 51 17.46	−20 52 55.4	0.5	0.2
113	674	1983 Oct.	7.84572	2 14 30.79	+ 0 53 28.0	0.1	0.1
114	674	1983 Oct.	7.86701	2 14 29.77	+ 0 53 28.2	0.1	0.1

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.

N	Numbers of stars and dependences						T
1	104169	.24842	123993	.48243	104231	.26915	
	104171	.27900	123970	.44541	124048	.27559	8
2	104169	.24026	123993	.47618	104231	.28356	
	104171	.27879	123970	.43752	124048	.28369	8
3	123959	.33881	104234	.37201	124049	.28918	
	104171	.09299	124000	.37604	104231	.53097	7
4	123959	.33364	104234	.37484	124049	.29152	
	104171	.08706	124000	.36986	104231	.54308	7

N			Numbers of stars and dependences				T
5	87000	.23726	104741	.34876	87131	.41398	
	87000	.32579	104741	.33828	87157	.33593	5
6	87000	.28475	104741	.27886	87131	.43639	
	87000	.37807	104741	.26785	87157	.35408	5
7	87000	.28591	104741	.27708	87131	.43701	
	87000	.37945	104741	.26605	87157	.35450	5
8	87000	.33708	104741	.20624	87131	.45668	
	87000	.43478	104741	.19469	87157	.37053	5
9	86282	.25646	86327	.31395	86357	.42959	
	86280	.23707	86329	.36310	86349	.39983	7
10	86282	.26477	86327	.31139	86357	.42384	
	86280	.24517	86329	.36168	86349	.39315	7
11	86282	.46519	86327	.24603	86357	.28878	
	86280	.43833	86329	.32571	86349	.23596	7
12	86282	.47452	86327	.24311	86357	.28237	
	86280	.44712	86329	.32404	86349	.22884	7
13	86234	.33233	86250	.28099	86357	.38668	
	86257	.41409	86299	.31922	86313	.26669	10
14	86234	.33663	86250	.27878	86357	.38459	
	86257	.41881	86299	.32173	86313	.25946	7
15	103713	.24484	103817	.35323	103826	.40193	
	103694	.35916	86065	.19607	103908	.44477	5
16	103713	.24766	103817	.34436	103826	.40798	
	103694	.36490	86065	.19052	103908	.44458	5
17	103613	.29981	103646	.35764	103683	.34255	
	103594	.38623	103649	.25887	103705	.35490	7
18	103613	.30230	103646	.35166	103683	.34604	
	103594	.38369	103649	.26439	103705	.35192	7
19	123581	.43701	123608	.48602	123658	.07697	
	123573	.41645	123606	.40778	123649	.17577	8
20	123581	.43534	123608	.48110	123658	.08356	
	123573	.40897	123606	.41177	123649	.17926	8
21	123621	.28841	123640	.40019	123769	.31140	
	123603	.21982	123612	.30970	123757	.47048	5
22	123621	.28781	123640	.39691	123769	.31528	
	123603	.21404	123612	.31264	123757	.47332	5
23	123630	.22239	123640	.25822	123769	.51939	
	123623	.26148	123666	.25627	123767	.48225	5

N	Numbers of stars and dependences						T
24	123621	.22989	123640	.22586	123769	.54425	
	123603	.16107	123666	.29793	123757	.54100	5
25	123666	.21101	123757	.39200	123791	.39699	
	123627	.29969	123757	.38287	123856	.31744	5
26	123952	.42030	124017	.24335	124051	.33635	
	123944	.28413	123985	.46210	124106	.25377	3
27	123952	.41656	124017	.24632	124051	.33712	
	123944	.28409	123985	.45981	124106	.25610	3
28	123998	.42613	124017	.32542	124051	.24845	
	123952	.32430	124022	.33732	124082	.33838	2
29	123998	.42444	124017	.32651	124051	.24905	
	123952	.32377	124022	.33776	124082	.33847	2
30	124009	.12392	124035	.41764	124090	.45844	
	124001	.32147	124051	.32067	124106	.35786	2
31	109916	.16637	109944	.43360	109991	.40003	
	109920	.22374	109929	.42245	110008	.35381	10
32	109916	.16242	109944	.43381	109991	.40377	
	109920	.22273	109929	.42012	110008	.35715	7
33	110324	.42595	110342	.24220	110361	.33185	
	110297	.37048	110357	.27604	110368	.35348	7
34	110324	.41536	110342	.24734	110361	.33730	
	110297	.36554	110357	.27777	110368	.35669	7
35	110513	.32470	110538	.43775	110547	.23755	
	110519	.42029	110536	.38416	110569	.19555	4
36	110513	.32243	110538	.44141	110547	.23616	
	110519	.41770	110536	.38681	110569	.19549	4
37	110503	.29331	129921	.43195	110580	.27474	
	110501	.15296	110512	.48825	129971	.35879	5
38	110503	.29323	129921	.43479	110580	.27198	
	110501	.15612	110512	.48533	129971	.35855	5
39	110494	.31487	110542	.36622	110578	.31891	
	110467	.19262	110542	.55183	129942	.25555	5
40	110494	.31674	110542	.36221	110578	.32105	
	110467	.19377	110542	.54890	129942	.25733	5
41	129857	.23370	110533	.61402	129916	.15228	
	110494	.27802	129870	.14055	129921	.58143	5
42	129857	.23684	110533	.60757	129916	.15559	
	110494	.27679	129870	.14446	129921	.57875	5

N	Numbers of stars and dependences						T
43	129857	.46441	110533	.14092	129916	.39467	
	110494	.18664	129870	.43116	129921	.38220	5
44	129857	.46724	110533	.13568	129916	.39708	
	110494	.18582	129870	.43449	129921	.37969	5
45	129832	.47103	129846	.20893	129876	.32004	
	129802	.33105	129862	.32337	129877	.34558	3
46	129832	.47322	129846	.20759	129876	.31919	
	129802	.33254	129862	.32110	129877	.34636	3
47	129676	.29652	129683	.26632	129783	.43716	
	129705	.39184	129693	.31390	129783	.29426	5
48	129676	.29839	129683	.26557	129783	.43604	
	129705	.39415	129693	.31331	129783	.29254	5
49	129648	.19788	129697	.57005	129717	.23207	
	129640	.32267	129717	.32131	129713	.35602	5
50	129648	.20294	129697	.56553	129717	.23153	
	129640	.32608	129717	.32428	129713	.34964	5
51	129648	.33711	129697	.44134	129717	.22155	
	129640	.35421	129704	.27292	129713	.37287	5
52	129648	.34166	129697	.43699	129717	.22135	
	129640	.35679	129704	.27489	129713	.36832	5
53	129533	.27286	129585	.43346	129673	.29368	
	129530	.31341	129610	.39532	129653	.29127	5
54	129533	.27315	129585	.43269	129673	.29416	
	129530	.31310	129610	.39619	129653	.29071	5
55	129533	.27811	129585	.41640	129673	.30549	
	129530	.30355	129610	.41861	129653	.27784	5
56	129533	.27851	129585	.41549	129673	.30600	
	129530	.30315	129610	.41983	129653	.27702	5
57	129533	.29041	129585	.34300	129673	.36659	
	129530	.24942	129610	.52047	129653	.23011	5
58	129533	.29065	129585	.34198	129673	.36737	
	129530	.24876	129610	.52189	129653	.22935	5
59	129533	.29328	129585	.31097	129673	.39575	
	129530	.22301	129610	.56526	129653	.21173	5
60	129576	.30134	129610	.16594	129617	.53272	
	129576	.38242	129607	.24352	129628	.37406	5
61	129576	.29326	129610	.17919	129617	.52755	
	129576	.37371	129607	.25276	129628	.37353	5

N		Numbers of stars and dependences					T
62	129683	.38067	129713	.36449	129771	.25484	
	129675	.39368	129721	.37985	129783	.22647	5
63	129683	.37820	129713	.35958	129771	.26222	
	129675	.38675	129721	.38380	129783	.22945	5
64	94634	.12742	94661	.52848	94703	.34410	
	94646	.45301	94668	.27594	94719	.27105	4
65	94792	.24476	94857	.22823	94903	.52701	
	94837	.31837	94872	.49568	94900	.18595	5
66	94792	.24373	94857	.22707	94903	.52920	
	94837	.31585	94872	.49564	94900	.18851	5
67	94903	.45256	94989	.26465	95069	.28279	
	94926	.25805	94965	.48955	95044	.25240	3
68	94903	.45162	94989	.26514	95069	.28324	
	94926	.25716	94965	.48936	95044	.25348	3
69	94900	.18438	94926	.32243	94985	.49319	
	94881	.26347	94965	.45672	94989	.27981	5
70	94900	.18684	94926	.32290	94985	.49026	
	94881	.26581	94965	.45628	94989	.27791	5
71	94900	.26061	94926	.34080	94985	.39859	
	94881	.33878	94965	.43975	94989	.22147	5
72	94900	.26279	94926	.34106	94985	.39615	
	94881	.34072	94965	.43936	94989	.21992	5
73	94857	.32691	94870	.40060	94953	.27249	
	94865	.36817	94883	.44459	94926	.18724	3
74	94857	.32811	94870	.40093	94953	.27096	
	94865	.37080	94883	.44408	94926	.18512	3
75	94528	.20695	94595	.40419	94700	.38886	
	94555	.32218	94559	.37728	94785	.30054	5
76	94528	.21059	94595	.40305	94700	.38636	
	94555	.32321	94559	.37877	94785	.29802	5
77	94541	.20419	94554	.35833	94604	.43748	
	94529	.44188	94595	.18783	94633	.37029	5
78	94528	.61839	94595	.28391	94700	.09770	
	94494	.21423	94559	.49361	94620	.29216	5
79	94528	.62118	94595	.28309	94700	.09573	
	94494	.21733	94559	.49369	94620	.28898	5
80	94445	.31323	94474	.25965	94604	.42712	
	94418	.08785	94500	.43492	94555	.47723	5

N	Numbers of stars and dependences						T
81	141817	.24543	141869	.39266	141892	.36191	
	141799	.27493	141869	.43049	141917	.29458	7
82	141817	.24179	141869	.39211	141892	.36610	
	141799	.27282	141869	.43006	141917	.29712	7
83	94237	.36204	94264	.34603	94295	.29193	
	94223	.22448	94273	.49055	94288	.28497	10
84	94237	.37063	94264	.34646	94295	.28291	
	94223	.23227	94273	.49056	94288	.27717	10
85	99256	.31553	99271	.43712	99299	.24735	
	99234	.25795	99271	.49901	99317	.24304	8
86	99256	.31871	99271	.43600	99299	.24529	
	99234	.26061	99271	.49657	99317	.24282	8
87	99227	.20886	99271	.55320	99280	.23794	
	99226	.32392	99271	.50140	99317	.17468	8
88	99227	.21105	99271	.55176	99280	.23719	
	99226	.32570	99271	.50013	99317	.17417	8
89	112647	.27954	112703	.36363	112750	.35683	
	112659	.25431	112674	.44132	112779	.30437	5
90	112647	.28085	112703	.36657	112750	.35258	
	112659	.25798	112674	.44006	112779	.30196	5
91	112647	.32379	112703	.45851	112750	.21770	
	112659	.27263	112674	.37908	112739	.34829	5
92	112647	.32485	112703	.46136	112750	.21379	
	112659	.27695	112674	.37791	112739	.34514	5
93	112570	.13092	112609	.59929	112706	.26979	
	112558	.19602	112619	.33126	112663	.47272	5
94	112570	.13135	112609	.60073	112706	.26792	
	112558	.19746	112619	.33187	112663	.47067	5
95	111941	.32972	111949	.20415	112107	.46613	
	111894	.15234	112003	.26368	112061	.58398	5
96	111941	.37621	111949	.28003	112107	.34376	
	111894	.27669	112003	.22274	112061	.50057	5
97	111941	.37719	111949	.28175	112107	.34106	
	111894	.27941	112003	.22185	112061	.49874	5
98	96402	.37307	96504	.21710	96587	.40983	
	96400	.30839	96544	.45409	96539	.23752	8
99	96402	.37087	96504	.22047	96587	.40866	
	96461	.24953	96470	.49333	96593	.25714	8

N	Numbers of stars and dependences						T
100	96402	.25034	96504	.40513	96587	.34453	
	96461	.29772	96470	.42109	96607	.28119	8
101	96448	.26811	96498	.30171	96544	.43018	
	96467	.25519	96504	.46235	96540	.28246	8
102	56401	.40841	56415	.42162	56498	.16997	
	56368	.37013	56392	.17094	56485	.45893	7
103	56401	.38991	56415	.43771	56498	.17238	
	56368	.35822	56392	.18096	56485	.46082	7
104	56401	.37989	56415	.44661	56498	.17350	
	56368	.35139	56392	.18676	56485	.46185	10
105	93901	.12600	94041	.62440	94047	.24960	
	93901	.21698	94041	.44727	94074	.33575	10
106	93901	.12848	94041	.62415	94047	.24737	
	93901	.21863	94041	.44857	94074	.33280	10
107	93901	.18650	94041	.61500	94047	.19850	
	93901	.25889	94041	.47404	94074	.26707	10
108	93901	.19083	94041	.61427	94047	.19490	
	93901	.26185	94041	.47595	94074	.26220	10
109	161149	.44084	161176	.22293	161271	.33623	
	161148	.29837	161203	.46426	161224	.23737	7
110	161149	.43541	161176	.22453	161271	.34006	
	161148	.29080	161203	.46943	161224	.23977	7
111	185778	.20871	185841	.44585	185907	.34544	
	160841	.23872	185836	.51837	160891	.24291	7
112	185778	.21137	185841	.44439	185907	.34424	
	160841	.24039	185836	.51982	160891	.23979	5
113	129756	.30462	110424	.47650	110432	.21888	
	129756	.37867	110424	.45057	110439	.17076	5
114	129756	.31144	110424	.47910	110432	.20946	
	129756	.38230	110424	.45429	110439	.16341	5

5. List of collaborators

Name	Exposures	Measurements	Reductions
G. Červák	–	27	–
J. Fabricius	50	12	–
P. Rychtarčík	64	75	–
J. Svoreň	–	–	114

References

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

Pittich, E.M., Svoreň, J.: 1995, *Contrib. Astron. Obs. Skalnaté Pleso* **25**, 13

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