

Astrometry of minor planets made at the Skalnaté Pleso Observatory in the years 1998 and 1999

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Abstract. The paper presents the results of position photographing of minor planets carried out at the Skalnaté Pleso Observatory in the years 1998 and 1999.

77 observations of 16 minor planets are given together with the list of reference stars and dependences. The presented result is the last obtained from the regular photographic observations lasting about a half of century.

Key words: asteroids – astrometry

1. Introduction

The presented paper is a continuation of the previous papers which gave the results of positional observations of minor planets obtained at the Skalnaté Pleso Observatory (the last paper of this series: Neslušan, 1999) and contains the observations made in the years 1998 and 1999.

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). The formulas used are given in the preceding paper on astrometry of minor planets (Svoreň, 1998).

The reduction constants as well as methods of observation and processing and all the other necessary data are not repeated here. They are also given in the paper by Svoreň (1998).

A total of 77 accurate positions of 16 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.

The presented result is the last obtained from the regular photographic observations lasting about a half of century.

2. 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.

N	MP	Date	U.T.	$R.A._{2000}$	$Decl._{2000}$	A	B	
1	16	1998	May	29.87083	14 50 13.30	-11 49 51.4	0.7	0.7
2	16	1998	May	29.94792	14 50 10.21	-11 49 40.1	0.8	0.3
3	21	1998	Jan.	25.82014	7 22 13.21	+24 44 34.0	0.1	0.3
4	21	1998	Jan.	25.86042	7 22 10.84	+24 44 39.9	0.2	0.1
5	21	1998	Jan.	26.86042	7 21 12.54	+24 46 57.8	0.3	0.3
6	21	1998	Jan.	26.90903	7 21 09.72	+24 47 04.4	0.6	0.3
7	22	1998	Mar.	30.78762	12 20 10.12	+17 50 51.2	0.6	0.4
8	22	1998	Apr.	22.81481	12 03 21.92	+17 44 35.6	0.2	0.2
9	55	1998	Feb.	18.89028	11 29 32.18	+8 29 02.4	0.4	0.0
10	55	1998	Feb.	18.93194	11 29 30.26	+8 29 10.9	0.6	0.7
11	55	1998	Feb.	20.83333	11 28 02.15	+8 36 23.7	0.1	0.9
12	55	1998	Feb.	20.87986	11 27 59.91	+8 36 33.8	0.1	0.4
13	55	1998	Feb.	26.88068	11 23 04.77	+8 59 50.0	0.2	0.9
14	55	1998	Feb.	26.90069	11 23 03.79	+8 59 55.4	0.4	0.6
15	55	1998	Mar.	1.78976	11 20 35.12	+9 11 09.8	0.5	0.5
16	55	1998	Mar.	1.80532	11 20 34.13	+9 11 14.5	0.2	0.6
17	55	1998	Mar.	30.80243	10 56 38.12	+10 37 37.7	0.8	0.4
18	135	1998	Jan.	1.70764	6 03 30.91	+26 49 04.8	0.6	0.0
19	135	1998	Jan.	1.72951	6 03 29.59	+26 49 05.1	0.6	0.6
20	135	1998	Jan.	2.80833	6 02 18.55	+26 48 27.4	0.8	0.5
21	135	1998	Jan.	2.82917	6 02 17.19	+26 48 25.5	0.7	0.6
22	136	1998	Feb.	20.81458	8 04 16.16	+8 01 23.3	0.1	0.8
23	136	1998	Feb.	20.89861	8 04 12.92	+8 01 59.6	0.6	0.4
24	136	1998	Feb.	23.89375	8 02 29.19	+8 23 43.6	0.5	0.6
25	136	1998	Feb.	23.93889	8 02 27.68	+8 24 03.9	0.5	0.3
26	216	1998	Jun.	27.85579	18 07 52.59	-6 40 25.3	0.6	0.2
27	216	1998	Jun.	27.87431	18 07 51.67	-6 40 23.7	0.3	0.7
28	216	1998	Jul.	22.88125	17 48 10.12	-6 38 25.8	0.3	0.7
29	216	1998	Jul.	22.96250	17 48 07.05	-6 38 32.4	0.0	0.4
30	441	1998	Jan.	25.80625	6 29 00.41	+16 17 26.7	0.3	0.9
31	441	1998	Jan.	25.84792	6 28 58.78	+16 17 24.2	0.1	0.1

N	MP	Date	U.T.	<i>R.A.</i> ₂₀₀₀	<i>Decl.</i> ₂₀₀₀	A	B
32	441	1998	Jan.	27.82847	6 27 45.05	+16 16 14.0	0.7 0.1
33	441	1998	Jan.	27.89861	6 27 42.48	+16 16 10.2	0.4 0.5
34	441	1998	Feb.	1.72292	6 25 09.79	+16 14 01.0	0.1 0.3
35	441	1998	Feb.	1.77188	6 25 08.47	+16 14 01.2	0.3 0.2
36	453	1998	Sep.	24.87847	0 49 52.14	+4 41 47.3	0.4 0.7
37	453	1998	Sep.	24.92708	0 49 49.06	+4 41 36.4	0.6 0.5
38	453	1998	Oct.	14.76806	0 28 45.34	+3 24 03.5	0.5 0.1
39	453	1998	Oct.	14.82639	0 28 41.40	+3 23 52.2	0.1 0.4
40	453	1998	Oct.	22.74392	0 21 25.70	+2 58 12.8	0.8 0.1
41	453	1998	Oct.	22.76667	0 21 24.52	+2 58 11.5	0.9 0.2
42	453	1998	Oct.	23.74907	0 20 36.17	+2 55 29.0	0.0 0.6
43	453	1998	Oct.	23.77153	0 20 35.14	+2 55 24.0	0.3 0.3
44	497	1998	Aug.	30.92361	23 15 07.74	-9 11 59.5	0.2 0.3
45	497	1998	Sep.	1.97569	23 13 33.30	-9 15 11.7	0.1 0.2
46	497	1998	Sep.	2.02431	23 13 30.86	-9 15 15.9	0.1 0.4
47	1036	1998	May	27.95694	21 02 04.75	+23 27 43.4	0.2 0.3
48	1036	1998	May	27.98611	21 02 08.72	+23 28 48.1	0.8 0.4
49	1036	1998	May	29.88333	21 06 30.92	+24 38 04.7	0.3 0.5
50	1036	1998	May	29.92847	21 06 37.09	+24 39 43.5	0.6 0.4
51	1036	1998	Jul.	20.85023	23 46 12.52	+52 55 28.2	0.3 0.7
52	1036	1998	Jul.	20.86319	23 46 15.77	+52 55 44.5	0.6 0.0
53	1036	1998	Nov.	24.80139	3 34 05.96	-7 14 43.0	0.6 0.0
54	1036	1998	Nov.	24.87500	3 34 02.63	-7 16 10.8	0.8 0.3
55	97	1999	Mar.	17.86111	12 58 48.51	+2 40 09.2	0.7 0.2
56	97	1999	Mar.	17.90417	12 58 46.60	+2 40 31.9	0.1 0.2
57	219	1999	Aug.	8.87847	21 36 58.47	+7 00 13.8	0.3 0.6
58	219	1999	Aug.	8.93403	21 36 56.22	+6 59 55.5	0.7 0.3
59	219	1999	Aug.	19.81273	21 29 42.49	+5 37 42.2	0.2 0.4
60	219	1999	Aug.	19.83287	21 29 41.58	+5 37 30.3	0.1 0.3
61	219	1999	Sep.	3.80972	21 21 16.24	+2 45 52.5	0.2 0.4
62	219	1999	Sep.	3.85000	21 21 15.14	+2 45 22.6	0.6 0.2
63	219	1999	Sep.	4.80556	21 20 52.20	+2 33 02.4	0.5 0.6
64	219	1999	Sep.	4.83333	21 20 51.51	+2 32 40.3	0.5 0.2
65	219	1999	Sep.	6.84444	21 20 07.93	+2 06 27.6	0.9 0.7
66	219	1999	Sep.	6.86667	21 20 07.45	+2 06 11.0	0.7 0.2
67	250	1999	Jan.	20.83056	7 27 25.83	+41 42 00.2	0.3 0.3
68	250	1999	Jan.	20.89722	7 27 21.58	+41 42 01.2	0.1 0.4
69	250	1999	Jan.	22.88403	7 25 20.17	+41 41 37.3	0.5 0.1
70	258	1999	Jan.	24.95208	8 42 05.46	-3 25 20.0	0.8 0.5
71	258	1999	Jan.	25.00903	8 42 02.39	-3 25 08.3	0.2 0.3
72	377	1999	Oct.	8.03889	1 59 16.10	+13 12 29.0	0.2 0.7
73	377	1999	Oct.	8.10417	1 59 13.35	+13 12 01.5	0.0 0.2
74	377	1999	Oct.	30.73310	1 41 28.00	+10 21 53.4	0.6 0.1
75	377	1999	Oct.	30.75851	1 41 27.19	+10 21 46.0	0.3 0.1
76	377	1999	Nov.	12.68785	1 32 37.45	+8 50 52.6	0.0 0.7
77	377	1999	Nov.	12.72188	1 32 36.25	+8 50 40.0	0.9 0.2

3. 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	158805	.39025	158844	.37503	158874	.23472	
	158810	.35279	158816	.35762	158884	.28960	8
2	158805	.39936	158844	.37720	158874	.22344	
	158810	.36013	158816	.35939	158884	.28048	8
3	79309	.29474	79326	.29032	79347	.41494	
	79310	.36405	79325	.38290	79363	.25305	10
4	79309	.31578	79326	.28645	79347	.39777	
	79310	.38170	79325	.37595	79363	.24235	10
5	79266	.21182	79303	.43755	79349	.35063	
	79269	.29388	79307	.30940	79347	.39672	10
6	79266	.22283	79303	.43546	79349	.34171	
	79269	.30343	79307	.31042	79347	.38615	10
7	100028	.43928	100055	.42818	100085	.13254	
	100001	.16487	100057	.57515	100064	.25998	15
8	99903	.24484	99919	.47576	99949	.27940	
	99894	.38583	99928	.16647	99940	.44770	12
9	118877	.39465	118892	.37210	118903	.23325	
	118854	.31189	118896	.30291	118905	.38520	16
10	118877	.40403	118892	.37331	118903	.22266	
	118854	.31800	118896	.30088	118905	.38111	16
11	118842	.41950	118872	.27775	118906	.30275	
	118845	.36474	118873	.35563	118903	.27962	14
12	118842	.42260	118872	.28198	118906	.29544	
	118845	.37107	118873	.35577	118903	.27316	14
13	118788	.46948	118844	.21181	118860	.31872	
	118788	.51279	118842	.23751	118872	.24970	14
14	118788	.47207	118844	.21027	118860	.31766	
	118788	.51528	118842	.23590	118872	.24882	14
15	118771	.36034	99556	.36979	118839	.26987	
	118771	.40231	99555	.33062	118843	.26707	14
16	118771	.36139	99556	.37139	118839	.26722	
	118771	.40330	99555	.33202	118843	.26468	14
17	99316	.29509	118592	.46688	99404	.23804	
	99330	.31259	99368	.47721	99404	.21020	2
18	77838	.31567	77870	.30520	77961	.37913	
	77827	.31527	77883	.30712	77961	.37760	14

N	Numbers of stars and dependences						T
19	77876	.42645	77870	.32987	77961	.24368	
	77872	.53459	77883	.24853	77961	.21688	14
20	77804	.30855	77838	.34912	77961	.34233	
	77783	.23911	77827	.36863	77961	.39226	10
21	77801	.27875	77838	.38977	77961	.33147	
	77753	.26241	77827	.28296	77961	.45463	10
22	116250	.37197	116326	.36255	116337	.26548	
	116269	.26625	116300	.62463	116372	.10913	26
23	116281	.52293	116307	.27244	116330	.20463	
	116257	.43654	116300	.34693	116381	.21653	26
24	116220	.40026	116240	.23580	116330	.36394	
	116196	.29245	116284	.45259	116305	.25496	24
25	116220	.39969	116240	.24211	116330	.35820	
	116196	.29805	116284	.44638	116305	.25557	24
26	142070	.26349	142099	.46596	142142	.27055	
	142064	.40964	142142	.31049	142119	.27987	8
27	142070	.26678	142099	.46455	142142	.26867	
	142064	.41249	142142	.31007	142119	.27743	8
28	141857	.56347	141877	.11424	141909	.32229	
	141842	.34061	141892	.35325	141902	.30614	16
29	141857	.57411	141877	.11303	141909	.31287	
	141842	.34964	141892	.34919	141902	.30116	16
30	95673	.27652	95700	.21499	95768	.50848	
	95640	.30117	95733	.39608	95817	.30275	18
31	95673	.27948	95700	.21797	95768	.50255	
	95640	.30515	95733	.39475	95817	.30011	18
32	95673	.42002	95700	.34353	95768	.23645	
	95640	.48210	95733	.33757	95817	.18032	18
33	95673	.42478	95700	.34807	95768	.22715	
	95640	.48840	95733	.33536	95817	.17624	18
34	95624	.08937	95629	.60277	95696	.30786	
	95616	.21040	95629	.54536	95721	.24424	10
35	95624	.09255	95629	.60671	95696	.30074	
	95616	.21071	95629	.55018	95721	.23911	10
36	109455	.33445	109502	.24829	109512	.41725	
	109456	.31937	109480	.40257	109527	.27806	30
37	109455	.34612	109502	.24053	109512	.41335	
	109456	.32790	109480	.40051	109527	.27160	30
38	109199	.19893	109216	.41280	109253	.38827	
	109184	.24871	109229	.37587	109248	.37543	30
39	109199	.20662	109216	.41759	109253	.37579	
	109184	.25982	109229	.37218	109248	.36801	30
40	109106	.35164	109173	.29698	109180	.35138	
	109115	.20409	109140	.24951	109173	.54639	30

N	Numbers of stars and dependences						T
41	109092	.35163	109180	.39357	109190	.25480	
	109115	.51853	109140	-.18783	109180	.66931	30
42	109092	.44634	109180	.33240	109190	.22125	
	109115	.33440	109140	.25698	109173	.40862	30
43	109092	.44837	109180	.33077	109190	.22086	
	109115	.33725	109140	.25694	109173	.40581	30
44	146579	.37450	146587	.49536	146640	.13014	
	146574	.50856	165596	.30937	146618	.18207	16
45	146545	.28734	165565	.52176	146618	.19090	
	146547	.44430	146579	.30295	165603	.25275	16
46	146545	.29347	165565	.52140	146618	.18513	
	146547	.45446	146579	.29640	165603	.24914	16
47	89339	.34778	89407	.23429	89431	.41794	
	89331	.23292	89394	.38458	89424	.38251	12
48	89339	.33345	89407	.24915	89431	.41740	
	89331	.22335	89394	.37835	89424	.39830	12
49	89424	.26864	89456	.28119	89479	.45017	
	89409	.29008	89465	.51207	89498	.19785	8
50	89424	.23274	89456	.30471	89479	.46255	
	89409	.27861	89465	.50318	89498	.21821	8
51	35686	.29753	35748	.48953	35837	.21293	
	35663	.33953	35748	.42466	35868	.23580	6
52	35686	.28900	35748	.49407	35837	.21693	
	35663	.33162	35748	.43120	35868	.23718	6
53	130548	.20806	130581	.45855	130590	.33339	
	130521	.28208	130592	.28182	130596	.43610	10
54	130548	.23151	130581	.43992	130590	.32857	
	130521	.29199	130592	.25329	130596	.45471	10
55	119662	.21759	119694	.41321	119712	.36920	
	119665	.39711	119684	.26729	119750	.33560	14
56	119662	.22572	119694	.40276	119712	.37151	
	119665	.40379	119684	.26316	119750	.33304	14
57	126908	.38820	126932	.42200	126968	.18980	
	126902	.36338	126918	.32020	126977	.31642	20
58	126908	.39769	126932	.41892	126968	.18339	
	126902	.36634	126918	.32516	126977	.30850	20
59	126805	.42966	126848	.29309	126877	.27725	
	126821	.32769	126825	.44191	126868	.23040	18
60	126805	.43400	126848	.28934	126877	.27666	
	126821	.33511	126825	.43919	126868	.22570	18
61	126709	.22399	126721	.58293	126751	.19309	
	126704	.41358	126727	.37604	126778	.21037	20
62	126709	.23701	126721	.57067	126751	.19232	
	126704	.41943	126727	.37150	126778	.20907	20

N	Numbers of stars and dependences						T
63	126709	.53695	126721	.27037	125751	.19268	
	126704	.55017	126727	.26056	126778	.18928	16
64	126709	.54563	126721	.26159	126751	.19278	
	126704	.55422	126727	.25718	126778	.18859	16
65	126672	.29460	126721	.31278	126733	.39261	
	126694	.29666	126701	.34420	126751	.35913	12
66	126672	.29657	126721	.30924	126733	.39419	
	126694	.30009	126701	.34228	126751	.35762	12
67	41745	.39891	41789	.32464	41822	.27646	
	41762	.42997	41768	.26303	41815	.30700	18
68	41745	.40898	41789	.32868	41822	.26234	
	41762	.45549	41768	.25240	41815	.29210	18
69	41736	.36092	41752	.42663	41796	.21246	
	41715	.29946	41755	.30626	41782	.39428	18
70	136163	.42799	136168	.28102	136246	.29099	
	136138	.34333	136183	.28936	136239	.36731	20
71	136163	.43402	136168	.28587	136246	.28010	
	136138	.35168	136183	.29094	136239	.35738	20
72	92704	.23300	92723	.13747	92748	.62953	
	92714	.35241	92745	.43876	92753	.20883	18
73	92704	.24122	92723	.13964	92748	.61915	
	92714	.36270	92745	.43901	92753	.19829	18
74	110027	.38656	92590	.32383	110090	.28961	
	92550	.33494	110048	.35371	92614	.31135	12
75	110027	.38941	92590	.32244	110090	.28814	
	92550	.26907	110048	.39006	92608	.34087	12
76	109911	.25412	109958	.34661	109990	.39927	
	109918	.23593	109941	.36975	110002	.39432	12
77	109911	.25824	109958	.34390	109990	.39786	
	109918	.27373	109941	.40745	110016	.31882	12

4. List of collaborators

Name	Exposures	Measurements	Reductions
G. Červák	50	50	—
L. Neslušan	—	—	77
P. Rychtarčík	27	27	—

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