

OBSERVATIONS OF COMETS AT THE SKALNATÉ PLESO OBSERVATORY IN THE YEARS 1964-1971

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Abstract: The results of 264 photographic positional observations of 32 comets obtained at the Skalnate Pleso Observatory are given. A description of the instruments and reduction are detailed. The results are contained in Tables 1 and 2.

1. The Observational Material and its Reduction

Observations of the motions of comets constitute a part of a continuing program of the Observatory within the frame of research of the interplanetary matter since the year 1946. Up to the year 1971, 94 comets were observed and a total of 850 accurate positions of these objects were determined. The first part of the results of positional observations of comets for the period 1946–1963 were published in the third volume of the Contributions of the Skalnate Pleso Observatory (Kresák and Antal 1966). This investigation is, essentially, a continuation of the preceding work and it contains 254 photographic positional observations of 32 comets made during the years 1964–1971.

The observational material was obtained with two instruments: until November, 1965 with the 60 cm, $f = 329$ cm Zeiss reflector, and since 1966 with the 30 cm, $f/5$ four-lens Zeiss astrograph. The observations with the reflector were made in the Newtonian focus on photographic plates of size 9×12 cm. This corresponds to a field of $1^\circ.5 \times 2^\circ$ in the sky. The plateholder had an arrangement by means of which it could be moved in any position angle, independently of the motion of the telescope. It was possible to move the plateholder in the range of 0.5° in steps of 0.016 mm, which corresponds to $1''$ (of arc). Thus, longer exposures required for very faint and diffuse comets were made possible. The faintest comets photographed with the 60 cm reflector were of about magnitude 18. By the end of 1965 the instrument was changed to the Cassegrain system and used exclusively for photoelectric photometry. Observations of comets continued to be made with the smaller Zeiss astrograph located in the West dome of the Observatory. The distance between the axis of this new telescope and that of the 60 cm reflector, relative to which

the accurate position of the Observatory is given, is 20.5 m West. The basic reduction constants of the Skalnate Pleso Observatory are as follows:

$$\begin{aligned}\lambda &= -1^{\text{h}}20^{\text{m}}58^{\text{s}}.77, \\ \varphi &= +49^\circ 11' 20''.0, \\ b &= 1783 \text{ m above sea-level,} \\ \varrho \sin \varphi' &= +0.75346, \\ \varrho \cos \varphi' &= 0.65501, \\ \Delta_{xy} &= -279, \\ \Delta z &= -321, \\ f &= 0.0033529 = 1/298.25.\end{aligned}$$

Referring to the given distance of the 30 cm astrograph from this baseline its $\lambda = -1\ 20\ 58\ 70$. However, the difference in the position of both instruments is entirely negligible in the determination of parallactic factors for comets and asteroids. The photographic observations with the 30 cm. Zeiss astrograph were made on plates of basic size 24×24 cm or with a reduction frame in the plateholder of 9×12 cm. Its disadvantage was that the telescope lacked an arrangement for an independent motion of the plateholder thus limiting the possibility of observing fainter comets. The photographic plates were manufactured mostly by ORWO with the emulsion ZU 1, ZU 2 and NP 27.

The plates were measured by means of a Zeiss measuring engine – Koordinatenmessgerät 30×30 No. 16178. On each plate the comet and the reference stars were measured several times in both coordinates and in the subsequent computation the mean measured values were used. In selecting the reference stars, primarily faint stars with known proper motions suitably located in the immediate vicinity of the comet, were chosen. Until 1966 the Yale catalogues, the AGK₂ and the proper motion catalogue EBL₂ were used for the reduction of observations. Only in the case of Comet 1965 VIII for the computation of positions No. 9 and 13 the

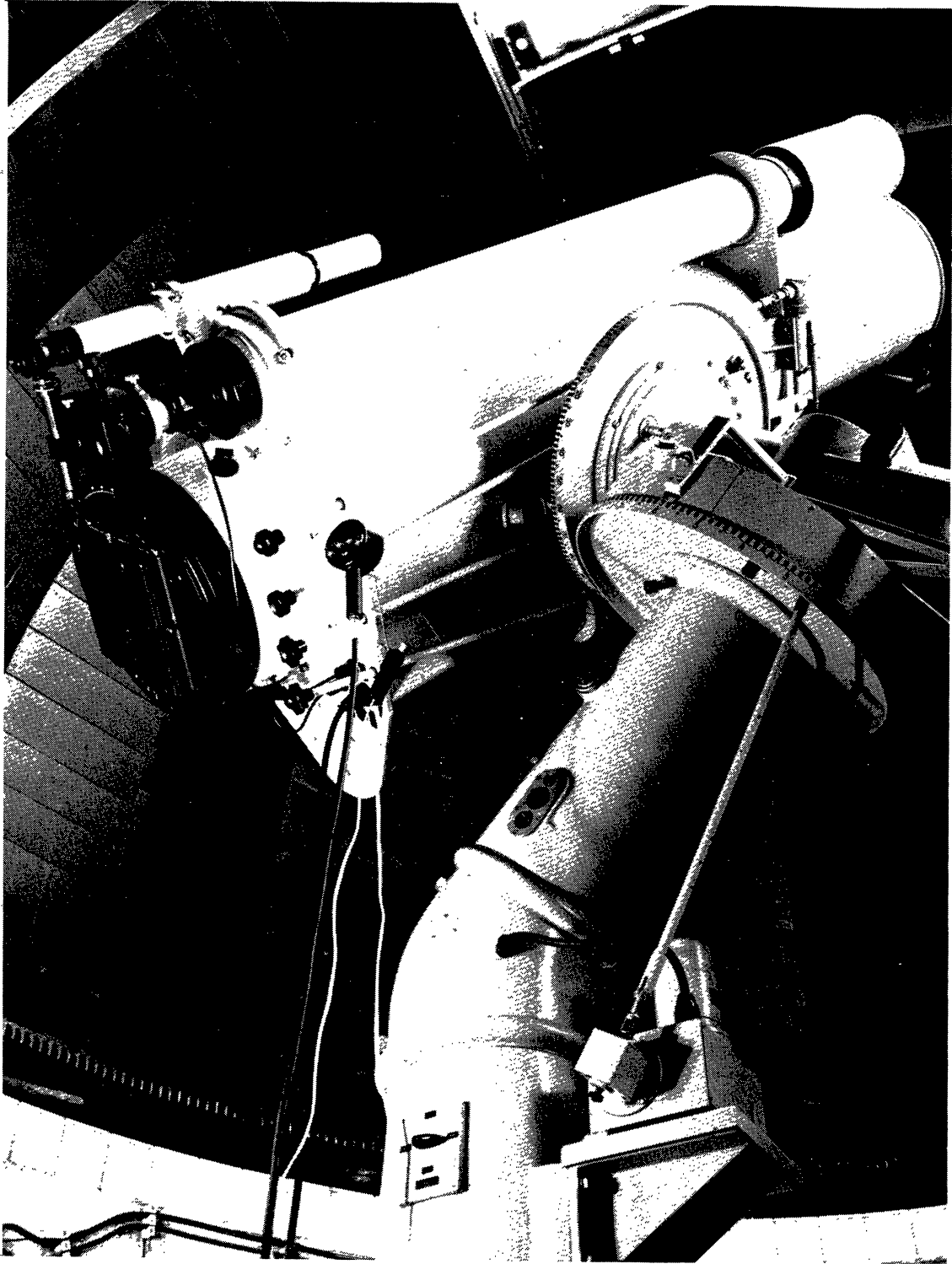


Fig. 1. The 30 cm $f/5$ astrograph with guide telescope 13 cm $f/15$.

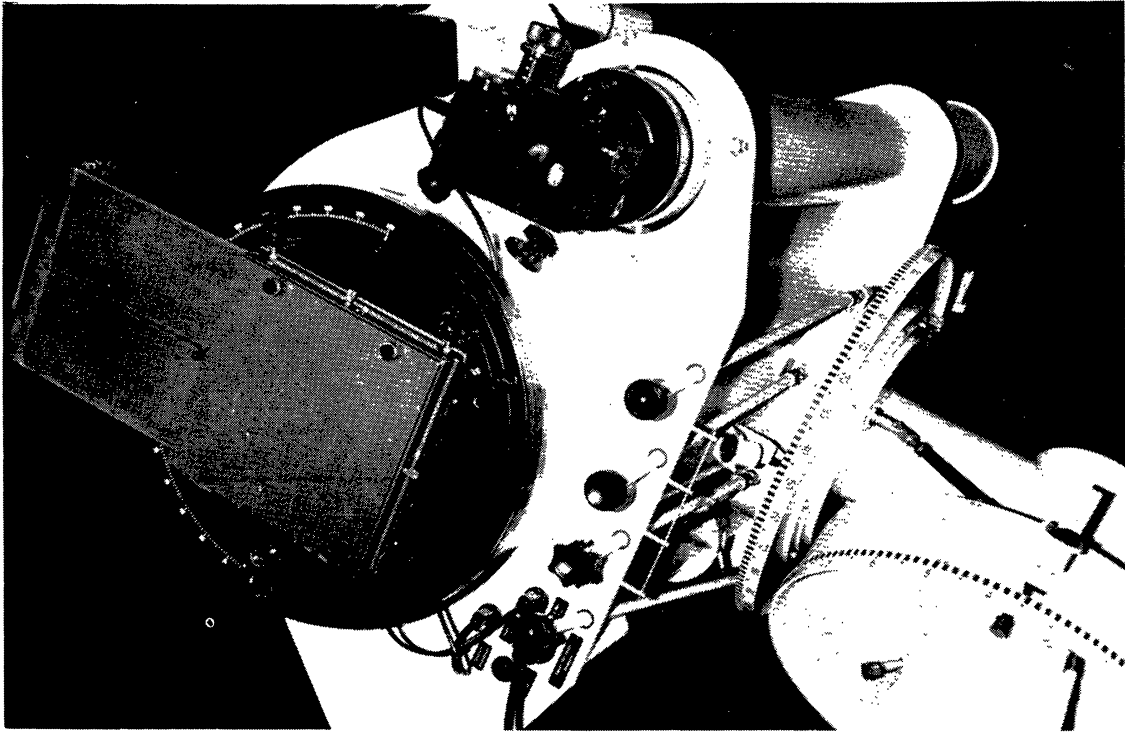


Fig. 2. The plate-holder 24×24 cm.

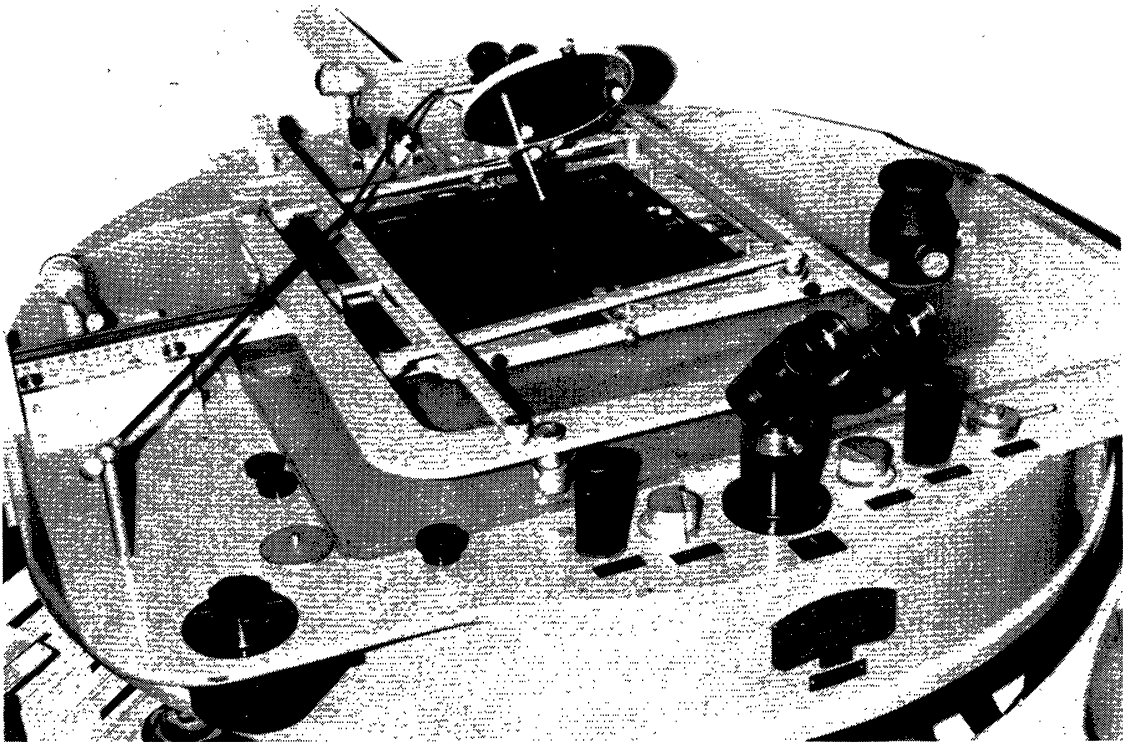


Fig. 3. The coordinate measuring instrument 30×30 cm.

Tacubaya Astrographic Catalogue was used. More recently the data about reference stars were nearly exclusively taken from the Smithsonian Star Catalogue (1966). With few exceptions the positions of comets were determined relative to two triplets reference stars. Thus, two independent determinations of the equatorial coordinates of a comet were obtained which, in addition to the check of computations, furnished information about the accuracy of measurements of the photographic plates. The reduction of measurements using the Schlesinger method of dependences was made by means of the ZRA 1 and GIER electronic computers of the Institute of Technical Cybernetics of the Slovak Academy of Sciences in Bratislava. Only the position of comets 1963 VIII inclusive 1965 IX and the first positions of new comets were computed by means of a desk calculator.

2. The Results of Measurements and Calculations

The results have been arranged in two Tables. Table 1 contains the positions of comets, arranged according to their definitive designation. The first column contains the running number of positions, the following columns give the mid-exposure in U. T., the R. A. and Declination for the equinox 1950.0, the exposure time in minutes and the last two columns contain the abbreviation of the names of observers and computers ($M + R$ = measured and reduced; a small c means positions reduced by means of an electronic computer). Additional information on the last two columns of this Table is contained in Table 5. The first column of Table 2 contains the same running number as that of Table 1. The following columns contain the title and the volume number, the zone of the catalogue used, the numbers of reference stars and the corresponding dependences. In the last columns are the differences between the positions of comets derived from two independent triangles, $\Delta \alpha \cos \delta$ and $\Delta \delta$ in seconds of arc, and finally remarks on the explanation as seen in Table 2. Table 3 contains information about the accuracy of measurements

of 247 positions. Each position was ordered into a corresponding interval according to the magnitude of the difference $\Delta \alpha \cos \delta$ and $\Delta \delta$ of the two independent determinations of equatorial coordinates from two triangles of reference stars. It can be seen from the Table that the differences in both coordinates for more than one half of positions are smaller than $0.5''$ and for more than 90 % of positions they are $\leq 1.0''$. The data give a good idea about the accuracy of measurements of the reference stars. It is expected that the position of comets with a nucleus or a well-developed central condensation is less than $1''$ in both coordinates for observations made with the 60 cm reflector and less than $1.5''$ for those made with the 30 cm astrograph. For faint comets without a nucleus or central condensation the expected error is no more than twice those values. This applies also to observations made under unfavourable atmospheric conditions, low above the horizon for a lower quality of the photographic plates, etc. A justification of this expectation follows from a comparison of large series of positions with accurate ephemerides. Table 4 contains a list of comets observed and the number of positions obtained. Table 5 gives the names of collaborators and a summary of their part taken in observations, measurements and reductions.

Acknowledgement. In conclusion, the author wishes to express his indebtedness to Dr. Ľudmila Pajdušáková, the Director of the Observatory at Skalnaté Pleso and to Dr. Ľubor Kresák, in charge of the division for interplanetary matter of the Institute, to Dr. Eduard Pittich for the significant help with the reduction of measurement by means of the electronic computers in Bratislava and to Mr. Štefan Dendis for his help with the measurements and the preparation of the results for publication.

REFERENCES

- Kresák, Ľ., Antal, M., 1966: Contributions of the Astronomical Observatory Skalnaté Pleso, 3, 113.
 Star Catalog, Smithsonian Astrophysical Observatory, 1966, Parts 1-3.

Table 1

No.	Date U. T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
1963 VIII Keams-Kwee						
1	1964 Feb. 15.77800	6 ^h 07 ^m 02 ^s .47	+28°39'39".1	15	A	A
2	1964 Feb. 15.78946	6 07 02 .87	+28 39 32.6	10	A	A
1964 III P/Kopff						
1	1964 July 8.00041	23 30 09 .86	-5 38 14.7	10	A	A
2	July 9.02124	23 31 20 .99	-5 37 02.5	10	A	A
3	July 13.96667	23 36 30 .25	-5 35 04.2	10	A	A
4	July 13.99063	23 36 31 .59	-5 35 04.8	5	A	A
5	July 19.00278	23 40 44 .61	-5 39 56.3	10	A	A+Aá
6	July 19.02361	23 40 45 .44	-5 39 57.2	10	A	A+Aá
7	July 21.03056	23 42 09 .48	-5 43 48.5	10	A	A
8	1964 July 21.04063	23 42 09 .84	-5 43 49.3	5	A	A
1964 VIII Ikeya						
1	1964 July 19.04375	4 25 39 .02	+14 54 10.0	2	A	A
2	July 19.04722	4 25 39 .23	+14 54 08.0	4	A	A
3	July 19.05694	4 25 39 .98	+14 54 01.5	2	A	A
4	July 19.05868	4 25 40 .03	+14 54 01.2	1	A	A
5	July 20.04722	4 26 58 .34	+14 43 37.7	4	A	A
6	July 20.05417	4 26 58 .77	+14 43 33.6	2	A	A
7	July 21.05694	4 28 26 .54	+14 32 16.0	4	A	A
8	July 21.06389	4 28 27 .34	+14 32 11.1	2	A	A
9	July 26.04307	4 38 38 .93	+13 21 04.7	4	A	A
10	July 26.04723	4 38 39 .77	+13 20 58.5	2	A	A
11	July 26.05765	4 38 41 .38	+13 20 47.5	4	A	A
12	July 26.06182	4 38 41 .89	+13 20 42.8	4	A	A
13	July 27.04307	4 41 31 .41	+13 02 30.5	4	A	A
14	July 27.04723	4 41 32 .22	+13 02 25.8	2	A	A
15	July 27.06182	4 41 34 .94	+13 02 08.4	4	A	A
16	July 27.06668	4 41 35 .82	+13 02 03.1	2	A	A
17	July 28.05000	4 44 49 .12	+12 41 44.5	4	A	A
18	July 28.05347	4 44 49 .83	+12 41 38.6	2	A	A
19	July 28.06250	4 44 51 .64	+12 41 27.0	4	A	A
20	1964 July 28.07639	4 44 54 .66	+12 41 07.6	2	A	A
1964 IX Everhart						
1	1964 Aug. 8.84094	15 20 03 .40	-6 58 44.5	24	A	A
2	Sept. 25.83403	16 30 40 .02	+26 01 02.8	10	A	A
3	Sept. 25.84271	16 30 40 .61	+26 01 12.5	5	A	A
4	Sept. 27.82188	16 33 50 .75	+26 42 25.4	5	A	A
5	Sept. 27.83229	16 33 51 .73	+26 42 38.9	5	A	A
6	Oct. 29.76944	17 33 32 .41	+35 59 37.8	10	A	A
7	Oct. 29.79340	17 33 35 .52	+35 59 59.8	5	A	A
8	Nov. 9.79028	17 58 51 .35	+38 52 08.0	10	A	A
9	1964 Nov. 9.80417	17 58 53 .39	+38 52 21.0	10	A	A
1965 VIII Ikeya-Seki						
1	1965 Sept. 24.13920	9 06 51 .58	-9 55 42.8	1	A	A
2	Sept. 24.14265	9 06 52 .53	-9 55 47.2	1	A	A
3	Sept. 24.14439	9 06 52 .71	-9 55 49.1	1	A	A
4	1965 Sept. 25.13359	9 11 25 .29	-10 11 12.8	1	A	A

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
5	1965 Sept. 25.13602	9 ^h 11 ^m 26 ^s .01	-10 ^o 11' 15".3	4	A	A
6	Sept. 25.14348	9 11 28.05	-10 11 22.7	1	A	A
7	Sept. 25.14539	9 11 28.70	-10 11 24.6	1	A	A
8	Oct. 1.13368	9 43 52.65	-11 52 01.2	1	A	A+De
9	Oct. 1.13785	9 43 54.36	-11 52 04.9	5	A	A+Aá
0	Oct. 1.14097	9 43 55.41	-11 52 08.0	1	A	A+De
11	Oct. 1.15087	9 43 59.13	-11 52 19.5	0.5	A	A+De
12	Oct. 1.15243	9 43 59.73	-11 52 20.5	1	A	A+De
13	Oct. 2.14028	9 50 20.42	-12 09 51.4	4	A	Aá
14	Oct. 2.14340	9 50 21.45	-12 09 54.1	2	A	A+De
15	Oct. 2.14583	9 50 22.41	-12 09 57.2	2	A	A+De
16	Oct. 6.14798	10 19 51.66	-13 20 43.7	2.2	A	A+De
17	Oct. 6.15104	10 19 53.22	-13 20 46.7	1	A	A+De
18	Oct. 6.15313	10 19 54.18	-13 20 47.8	1	A	A
19	Oct. 6.15920	10 19 57.17	-13 20 54.4	0.5	A	A+De
20	Oct. 6.16094	10 19 58.24	-13 20 55.7	0.5	A	A+De
21	Nov. 17.15766	11 18 22.74	-27 57 33.4	2	A	A+De
22	1965 Nov. 17.18127	11 18 17.24	-27 58 13.5	2	A	A
1965 IX Alcock						
1	1965 Sept. 27.83022	16 57 38.90	+34 22 06.5	5	A	A
2	Sept. 29.80069	17 05 20.44	+32 57 14.2	4	A	A
3	Sept. 29.84243	17 05 30.19	+32 55 25.3	4	A	A
4	Sept. 30.78819	17 09 14.39	+32 13 16.3	6	A	A+De
5	Sept. 30.84236	17 09 27.76	+32 10 40.9	4	A	A+De
6	Oct. 2.82986	17 17 23.12	+30 39 16.9	6	A	A
7	Oct. 3.79722	17 21 17.29	+29 53 17.9	6	A	A
8	Oct. 3.80347	17 21 18.68	+29 53 00.6	6	A	A
9	Oct. 7.78333	17 37 34.79	+26 34 28.4	4	A	A+Aá
10	Oct. 7.78889	17 37 36.24	+26 34 11.8	4	A	A+De
11	Oct. 27.71389	19 01 37.48	+7 26 43.2	6	A	A+De
12	1965 Oct. 27.73472	19 01 42.61	+7 25 31.8	6	A	A+De
1966 II Barbon						
1	1966 Sept. 4.87361	00 46 47.55	-5 29 17.6	4	A	A,c
2	Sept. 4.89028	00 46 46.99	-5 29 36.6	4	A	A,c
3	Sept. 12.89583	00 44 12.03	-7 41 24.3	6	A	A,c
4	1966 Sept. 13.92396	00 44 11.29	-7 41 50.3	15	A	A,c
1966 III P/Van Biesbroeck						
1	1966 June 11.99306	18 38 26.86	-13 49 14.7	30	A	A,c
2	June 12.01215	18 38 26.42	-13 49 14.4	15	A	A,c
3	June 12.95313	18 38 05.13	-13 50 03.6	15	A	A,c
4	June 12.99479	18 38 04.06	-13 50 04.0	15	A	A,c
5	June 13.01563	18 38 03.40	-13 50 05.5	15	A	A,c
6	June 17.92882	18 35 58.88	-13 55 51.7	15	A	A+De
7	June 17.96007	18 35 57.96	-13 55 54.8	15	A	A,c
8	July 9.92813	18 24 51.04	-14 53 05.7	15	A	A,c
9	July 9.96979	18 24 49.86	-14 53 13.3	15	A	A,c
10	July 10.89757	18 24 23.69	-14 56 38.2	15	A	A,c
11	July 10.93924	18 24 22.21	-14 56 47.4	15	A	A,c
12	July 11.96771	18 23 53.68	-15 00 36.9	15	A	A,c
13	July 12.00833	18 23 52.50	-15 00 42.8	20	A	A,c
14	July 12.89063	18 23 28.72	-15 04 04.5	15	A	A,c
15	July 12.95972	18 23 26.90	-15 04 19.0	15	A	A,c
16	July 13.87326	18 23 02.86	-15 07 50.3	15	A	A,c
17	1966 July 13.91493	18 23 01.59	-15 08 00.7	15	A	A,c

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
18	1966 July 16.98125	18 ^h 21 ^m 45 ^s .71	-15°20'11".6	20	A	A,c
19	July 16.99896	18 21 45 .32	-15 20 15.2	15	A	A,c
20	July 17.89583	18 21 24 .96	-15 23 54.8	15	A	A,c
21	July 17.93750	18 21 23 .95	-15 24 05.6	15	A	A,c
22	Aug. 8.88229	18 18 14 .51	-17 01 31.4	15	A	A,c
23	1966 Aug. 8.90313	18 18 14 .74	-17 01 41.3	15	A	A,c
1966 V Kilston						
1	1966 Aug. 10.86528	17 54 39 .42	+20 47 24.4	4	A	A+De
2	Aug. 10.87292	17 54 39 .50	+20 47 14.9	10	A	A,c
3	Aug. 10.96285	17 54 40 .36	+20 45 23.6	1	A	A,c
4	Aug. 10.97049	17 54 40 .49	+20 45 13.4	15	A	A,c
5	Sept. 4.81389	18 07 02 .94	+11 31 24.2	4	A	A,c
6	Sept. 4.82153	18 07 03 .29	+11 31 14.3	4	A	A,c
7	Sept. 12.78681	18 14 15 .08	+8 29 03.3	4	A	A,c
8	Sept. 12.80764	18 14 16 .25	+8 28 35.3	4	A	A,c
9	1966 Sept. 12.82188	18 14 17 .18	+8 28 14.2	15	A	A,c
1967 III Wild						
1	1967 Feb. 13.83403	6 03 54 .36	+75 19 52.2	4	A	A,c
2	Feb. 13.88542	6 03 07 .18	+75 11 47.5	10	A	A,c
3	Feb. 13.89236	6 03 02 .41	+75 11 07.0	10	A	A,c
4	Feb. 13.96250	6 02 00 .08	+75 00 03.4	2	A	A+De
5	Feb. 13.96944	6 01 54 .21	+74 59 00.2	2	A	A+De
6	Mar. 1.79514	5 08 16 .19	+36 04 57.5	4	A	A,c
7	Mar. 1.81597	5 08 15 .65	+36 02 32.9	4	A	A,c
8	Mar. 1.83819	5 08 14 .89	+35 59 59.4	4	A	A,c
9	Mar. 7.88620	5 07 20 .30	+25 45 40.9	4	A	A,c
10	Mar. 7.89653	5 07 20 .35	+25 44 51.7	4	A	A,c
11	Mar. 7.90694	5 07 20 .39	+25 43 51.8	4	A	A,c
12	Mar. 10.80278	5 07 38 .90	+21 45 58.7	4	A	A,c
13	Mar. 10.81319	5 07 39 .04	+21 45 11.3	4	A	A,c
14	1967 Mar. 10.82361	5 07 39 .05	+21 44 22.5	4	A	A,c
1967 IV Seki						
1	1967 Feb. 16.14931	20 13 41 .66	+27 12 45.9	10	A	A,c
2	Feb. 16.15694	20 13 46 .97	+27 12 47.0	4	A	A,c
3	Feb. 16.16736	20 13 54 .30	+27 12 51.5	4	A	A,c
4	Feb. 16.17361	20 13 58 .34	+27 12 55.2	2	A	A
5	1967 Feb. 16.18403	20 14 05 .71	+27 12 58.8	2	A	A
1967 V P/Tuttle						
1	1967 Feb. 10.74583	0 55 00 .04	+28 47 21.0	20	A	A+De
2	Feb. 10.75208	0 55 01 .16	+28 47 11.9	20	A	A+De
3	Mar. 1.75208	2 08 19 .80	+19 32 19.0	4	A	A,c
4	Mar. 1.76944	2 08 23 .69	+19 31 52.0	4	A	A,c
5	Mar. 1.77639	2 08 25 .24	+19 31 35.7	8	A	A,c
6	Mar. 10.75694	2 41 16 .61	+14 46 14.7	4	A	A,c
7	Mar. 10.77778	2 41 21 .19	+14 45 34.2	4	A	A,c
8	1967 Mar. 10.78472	2 41 22 .85	+14 45 21.8	8	A	A,c

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
1967 X P/Tempel 2						
1	1967 June 6.95694	18 ^h 25 ^m 45 ^s .75	-2°59' 48".9	10	A	A,c
2	June 6.99861	18 ^h 25 ^m 46 ^s .53	-2 59 48.9	10	A	A,c
3	June 14.98472	18 27 46 .39	-3 57 01.3	10	A	A,c
4	June 15.00556	18 27 46 .47	-3 57 14.0	10	A	A,c
5	July 13.93021	18 31 14 .59	-13 46 23.5	5	A	A,c
6	1967 July 13.95243	18 31 14 .85	-13 47 03.4	5	A	A,c
1967 XI P/Reinmuth 2						
1	1967 Oct. 7.00208	23 16 03 .12	+8 53 26.3	30	A	A,c
2	1967 Oct. 7.02118	23 16 02 .80	+8 53 22.3	15	A	A,c
1967 XIV P/Wirtanen						
1	1967 Nov. 1.90903	3 50 50 .32	-1 22 50.6	30	A	A,c
2	Nov. 1.95069	3 50 49 .27	-1 22 35.1	30	A	A,c
3	Nov. 24.90625	3 38 40 .12	+3 03 04.8	20	A	A,c
4	1967 Nov. 24.94792	3 38 38 .58	+3 03 45.2	20	A	A,c
1968 I Ikeya-Seki						
1	1968 Jan. 10.18542	16 42 09 .60	+1 43 59.2	10	A	A,c
2	Jan. 10.19167	16 42 09 .91	+1 44 08.7	2	A	A+De
3	Jan. 10.19931	16 42 10 .23	+1 44 20.5	4	A	A,c
4	Jan. 10.20694	16 42 10 .56	+1 44 32.8	4	A	A,c
5	Jan. 11.19444	16 42 57 .06	+2 08 28.8	4	A	A,c
6	Jan. 11.20139	16 42 57 .44	+2 08 40.7	10	A	A,c
7	1968 Jan. 11.20833	16 42 57 .62	+2 08 47.7	4	A	A+De
1968 II P/Schwassmann-Wachmann						
1	1968 Jan. 25.98125	6 07 30 .42	+21 16 39.4	16	A	A,c
2	1968 Jan. 26.02292	6 07 29 .52	+21 16 45.3	16	A	A,c
1968 IV Tago-Honda-Yamamoto						
1	1968 May 15.94722	3 31 10 .72	+61 13 45.3	2	A	A,c
2	May 15.95278	3 31 14 .07	+61 13 47.6	4	A	A,c
3	May 16.00110	3 31 40 .85	+61 14 06.6	2	A	A+De
4	May 16.01250	3 31 46 .98	+61 14 09.3	6	A	A,c
5	May 18.95694	3 55 35 .68	+61 14 04.0	4	A	A,c
6	May 18.96111	3 55 37 .56	+61 14 02.0	2	A	A,c
7	May 19.02083	3 56 03 .16	+61 13 44.3	2	A	A+De
8	May 19.02778	3 56 06 .42	+61 13 41.7	6	A	A,c
9	June 5.97708	5 05 16 .85	+56 44 15.9	6	A	A,c
10	1968 June 5.98750	5 05 18 .53	+56 44 05.7	6	A	A,c
1968 V Whitaker-Thomas						
1	1968 July 2.92222	15 26 20 .63	+31 22 23.0	2	A	A+De
2	1968 July 2.92569	15 26 20 .42	+31 22 34.5	2	A	A+De

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
1968 VI Honda						
1	1968 July 13.00382	5 ^h 08 ^m 57 ^s .74	+42° 45' 53".9	7	De	Zv+De
2	July 23.02361	5 08 24 .91	+46 56 03.3	2	A	A,c
3	July 23.05486	5 08 24 .65	+46 56 57.5	2	A	A
4	July 31.03299	5 06 25 .72	+51 24 33.4	1	A	A+De
5	July 31.05000	5 06 25 .47	+51 25 13.1	2	A	A+De
6	Aug. 1.03507	5 06 01 .05	+52 04 12.3	1	A	A,c
7	Aug. 1.05382	5 06 00 .55	+52 04 57.2	1	A	A,c
8	Aug. 4.91215	5 03 52 .67	+54 53 47.7	1	A	A,c
9	Aug. 4.95660	5 03 51 .22	+54 55 55.0	1	A	A,c
10	Aug. 5.02083	5 03 48 .46	+54 58 59.1	2	A	A,c
11	Aug. 15.98507	4 46 58 .59	+66 21 56.9	1	A	A,c
12	Aug. 15.99201	4 46 57 .17	+66 22 32.0	1	A	A,c
13	Aug. 16.00104	4 46 55 .49	+66 23 15.4	1	A	A,c
14	1968 Aug. 16.00799	4 46 54 .29	+66 23 48.8	1	A	A,c
1968 VII Bally-Clayton						
1	1968 Oct. 23.77847	17 28 53 .09	+32 08 17.4	10	A	A+De
2	1968 Oct. 23.78750	17 28 53 .26	+32 08 16.1	10	A	A+De
1969 I Thomas						
1	1969 Jan. 7.79375	4 35 24 .30	+81 33 57.5	4	A	A+De
2	Jan. 7.80139	4 35 23 .81	+81 33 55.2	10	A	A+De
3	Jan. 8.80556	4 33 56 .23	+81 30 06.6	10	A	A+De
4	Jan. 8.81944	4 33 54 .38	+81 30 01.8	10	A	A+De
5	1969 Jan. 11.74097	4 30 25 .51	+81 17 38.7	10	A	A+De
1969 V P/Honda-Mrkos-Pajdušáková						
1	1969 Sept. 30.12083	10 14 48 .62	+7 15 58.1	2	A	A,c
2	Sept. 30.12778	10 14 50 .02	+7 15 42.1	2	A	A,c
3	1969 Sept. 30.13819	10 14 52 .33	+7 15 15.8	2	A	A,c
1969 VI P/Faye						
1	1969 Oct. 17.02368	5 13 34 .99	+14 21 20.4	4	A	A,c
2	Oct. 17.04032	5 13 36 .27	+14 21 06.1	4	A	A,c
3	Oct. 18.00764	5 14 48 .15	+14 10 00.7	4	A	A,c
4	Oct. 18.04931	5 14 51 .00	+14 09 33.7	4	A	A,c
5	1969 Oct. 18.05625	5 14 51 .79	+14 09 26.7	4	A	A,c
1969 VII Fujikawa						
1	1969 Aug. 16.06597	5 57 16 .10	+18 53 21.3	8	A	A
2	Sept. 30.12083	10 07 38 .50	+6 00 40.0	2	A	A,c
3	Sept. 30.12778	10 07 40 .93	+6 00 27.1	2	A	A,c
4	1969 Sept. 30.13819	10 07 44 .45	+6 00 13.0	2	A	A,c
1969 IX Tago-Sato-Kosaka						
1	1969 Oct. 16.71257	16 24 50 .81	-5 22 10.6	2	A	A
2	1969 Oct. 17.70995	16 25 41 .40	-5 52 02.3	2	A	A

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
3	1969 Oct. 18.70565	16 ^h 26 ^m 32. ^s 83	-6 ^o 21' 50".6	2	A	A
4	Oct. 19.70347	16 27 26.58	-6 52 13.9	4	A	A
5	1970 Jan. 25.74861	1 10 25.71	+1 57 09.7	0.5	A	A,c
6	Jan. 25.75347	1 10 28.14	+1 58 12.1	1	A	A,c
7	Jan. 25.76944	1 10 36.20	+2 01 33.7	1	A	A,c
8	Jan. 26.71806	1 18 28.80	+5 15 26.6	1	A	A,c
9	Jan. 26.72222	1 18 30.76	+5 16 14.9	1	A	A,c
10	Feb. 7.74340	2 29 42.19	+30 25 12.2	1	A	A,c
11	Feb. 7.74896	2 29 43.65	+30 25 35.7	1	A	A,c
12	Feb. 7.79062	2 29 54.57	+30 28 36.6	1	A	A,c
13	1970 Feb. 7.81215	2 29 59.92	+30 30 09.4	1	A	A,c
1970 II Bennett						
1	1970 July 31.93333	4 44 08.91	+75 53 27.7	10	A	A,c
2	1970 Aug. 1.87431	4 44 49.61	+76 02 28.2	4	A	A,c
3	1970 Aug. 1.91458	4 44 52.05	+76 02 50.9	4	A	A,c
1970 III Kohoutek						
1	1969 Aug. 14.91319	19 03 47.39	+29 13 43.3	20	A	A
2	1969 Aug. 14.97153	19 03 41.10	+29 13 24.3	20	A	A
1970 X Suzuki-Sato-Seki						
1	1970 Nov. 12.68889	17 55 47.58	+15 19 52.4	6	A	A+De
1970 XV Abe						
1	1970 July 30.01042	2 16 21.93	+36 59 18.3	4	A	A
2	July 30.02569	2 16 21.42	+36 59 59.7	4	A	A,c
3	July 30.03194	2 16 21.12	+37 00 18.0	2	A	A
4	July 30.03819	2 16 20.67	+37 00 34.8	2	A	A,c
5	Aug. 1.97153	2 14 05.71	+39 18 04.1	4	A	A,c
6	Aug. 1.98611	2 14 04.90	+39 18 46.8	4	A	A,c
7	Aug. 2.00694	2 14 03.84	+39 19 50.8	4	A	A,c
8	Aug. 2.01528	2 14 03.50	+39 20 14.7	4	A	A,c
9	Aug. 2.02153	2 14 03.13	+39 20 32.6	4	A	A,c
10	Aug. 2.96319	2 13 09.05	+40 07 54.3	4	A	A,c
11	Aug. 2.98403	2 13 07.72	+40 08 56.9	4	A	A,c
12	Aug. 3.00486	2 13 06.34	+40 10 00.9	4	A	A,c
13	Aug. 3.02569	2 13 05.12	+40 11 05.1	4	A	A,c
14	Aug. 31.88021	21 22 27.55	+74 11 37.1	9	Pe	A,c
15	Aug. 31.88924	21 22 06.69	+74 11 35.3	3	Pe	A,c
16	Aug. 31.89410	21 21 55.85	+74 11 33.5	1	Pe	A,c
17	Sept. 7.86910	18 10 04.24	+66 12 57.1	9	Pe	A,c
18	Sept. 7.88160	18 09 52.10	+66 11 36.8	3	De	A,c
19	Sept. 7.88924	18 09 44.61	+66 10 43.3	1	De	A,c
20	Sept. 8.87743	17 55 00.53	+64 19 18.1	9	De	A,c
21	Sept. 8.88924	17 54 50.55	+64 17 55.8	3	De	A,c
22	Sept. 8.89757	17 54 43.67	+64 16 56.8	3	De	A,c
23	Sept. 8.91562	17 54 29.00	+64 14 55.7	15	De	A,c
24	Sept. 9.92396	17 41 44.27	+62 17 38.1	1	Pe	A,c
25	Sept. 9.92882	17 41 41.02	+62 17 04.7	3	Pe	A,c
26	Sept. 9.93646	17 41 35.58	+62 16 10.0	9	Pe	A,c
27	1970 Sept. 10.94410	17 30 43.66	+66 17 18.5	9	Pe	A,c

Continuation Table 1

No.	Date U.T.	$\alpha_{1950.0}$	$\delta_{1950.0}$	t	Obs.	M+R
28	1970 Sept. 10.95104	17 ^h 30 ^m 39 ^s .51	+60° 16' 29".0	3	Pe	A, c
29	Sept. 10.95590	17 30 36.99	+60 15 51.6	1	Pe	A, c
30	Oct. 17.74028	16 03 31.32	+15 03 09.0	4	A	A, c
31	Oct. 17.74514	16 03 31.17	+15 02 57.5	2	A	A, c
32	Oct. 17.75069	16 03 31.06	+15 02 46.0	4	A	A, c
33	Oct. 18.73542	16 03 .05 .24	+14 27 02.5	4	A	A, c
34	1970 Oct. 18.74167	16 03 05.21	+14 26 49.5	4	A	A, c

1971 II P/Encke

1	1970 Nov. 25.85069	21 22 16.91	+14 13 34.6	10	A	A, c
2	Nov. 25.86250	21 22 13.67	+14 13 02.2	10	A	A, c
3	Nov. 26.75694	21 17 54.32	+13 34 08.0	6	A	A, c
4	Nov. 28.69653	21 08 36.36	+12 08 59.5	6	A	A, c
5	Nov. 28.71806	21 08 29.78	+12 07 51.2	6	A	A, c
6	1970 Nov. 28.72847	21 08 26.61	+12 07 27.6	6	A	A, c

1971 V Toba

1	1971 Apr. 20.08472	22 06 03.08	+8 31 44.4	4	A	A, c
2	Apr. 20.09514	22 06 02.63	+8 31 24.2	2	A	A, c
3	1971 Apr. 20.10000	22 06 03.45	+8 31 17.8	4	A	A, c

Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
1963 VIII Kearns-Kwee							
1	Yale 24	2986 .33770	3001 .30162	3025A .36068	0.4	0.2	a
		2995 .33220	3009 .59130	3018 .07650			
2	Yale 24	2986 .33135	3001 .30680	3025A .36185	0.4	0.1	a
		2995 .32141	3009 .60612	3018 .07247			

1964 III P/Kopff

1	Yale 16	8334 .23025	8342 .45852	8345 .31123	0.1	0.3	
		8336 .39471	8342 .23831	8346 .36698			
2	Yale 16	8342 .05758	8345 .43784	8346 .50458	0.1	0.0	
		8345 .38325	8346 .67317	8353 -.05642			
3	Yale 16, 17	8101 .23463	8110 .27872	8366 .48665	0.1	0.0	
4	Yale 16, 17	8101 .22295	8110 .28734	8366 .48971			
5	Yale 16, 17	8373 .30403	8384 .54755	8126 .14842			
6	Yale 16, 17	8373 .29713	8384 .55637	8126 .14650			
7	Yale 16, 17	8384 .72793	8126 -.03916	8398 .31123			
8	Yale 16, 17	8384 .72610	8126 -.03955	8398 .31345			

1964 VIII Ikeya

1	AGK2 +14°, +15°, Yale 19	368 .16534	402 .56067	403 .27399	0.4	0.1	b, d, e
		400 .73932	1301 .21916	1315G .04152			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
2	AGK2 +14°, +15° Yale 19	400 .73636	368 .16006	403 .27426	0.5	0.2	d, e
		400 .73636	1301 .22086	1315G .04152			
3	AGK2 +14°, +15° Yale 19	368 .14129	402 .58370	403 .27501	0.6	0.4	b, d, e
		400 .72642	1301 .22631	1315G .04727			
4	AGK2 +14°, +15° Yale 19	368 .14050	402 .58413	403 .27537	0.3	0.2	e
		400 .72595	1301 .22644	1315G .04761			
5	Yale 19	1305 .46028	1312 .42656	1315G .11316	0.0	0.2	d, e
		1301 .41224	1311 .24275	1315G .34501			
6	Yale 19	1305 .45544	1312 .43427	1315G .11029	0.3	0.0	d, e
		1301 .40803	1311 .24820	1315G .34377			
7	Yale 19 AGK2 +14°	1311 .23284	1320 .37669	410 .39047	0.6	0.1	b
		1317G .66114	410 .57143	1323 -.23257			
8	Yale 19 AGK2 +14°	1311 .22231	1320 .36294	410 .41475	0.3	0.3	
		1317G .63391	410 .58495	1323 .21886			
9	Yale 19 AGK2 +13°	1351 .50222	1361 .21014	1363 .28764	0.1	0.3	
		367 .13594	1352 .34852	1361 .51554			
10	Yale 19 AGK2 +13°	1351 .49836	1361 .21175	1363 .28989	0.0	0.1	
		367 .14302	1352 .33518	1361 .52180			
11	Yale 19 AGK2 +13°	1351 .49094	1361 .21563	1363 .29343	0.2	0.4	
		367 .15603	1352 .31019	1361 .53378			
12	Yale 19 AGK2 +13°	1351 .48866	1361 .21615	1363 .29519	0.3	1.0	
		367 .16190	1352 .30010	1361 .53800			
13	Yale 19 AGK2 +12°	1363 .13520	1366 .82729	473 .03751	0.3	0.1	
		1361 .28497	1365 .39983	473 .31520			
14	Yale 19 AGK2 +12°	1363 .13510	1366 .81834	473 .04656	0.5	0.1	
		1361 .28191	1365 .39717	473 .32092			
15	Yale 19 AGK2 +12°	1363 .13701	1366 .78387	473 .07912	0.2	0.1	
		1361 .27087	1365 .38941	473 .33972			
16	Yale 19 AGK2 +12°	1363 .13732	1366 .77330	473 .08938	0.4	0.1	
		1361 .26744	1365 .38659	473 .34597			
17	Yale 19 AGK2 +12°	475 .50559	1382 .36841	479 .12600	0.2	0.3	
		475 .50797	1378G .23441	480 .25762			
18	Yale 19 AGK2 +12°	475 .50360	1382 .36535	479 .13105	0.2	0.3	
		475 .50655	1378G .23192	480 .26153			
19	Yale 19 AGK2 +12°	475 .49755	1382 .36055	479 .14189	0.1	0.2	
		475 .50127	1378G .22778	480 .27095			
20	Yale 19 AGK2 +12°	475 .48748	1382 .35231	479 .16021	0.1	0.5	
		475 .49252	1378G .22093	480 .28655			

1964 IX Everhart

1	Yale 16	5361G .38247	5363 .34686	5389 .27067	0.4	0.9	b, e, f
		5364G .25469	5368 .63338	5392 .11193			
2	Yale 24 AGK2 +26°	7685 .57899	7692 .00760	7711 .41341	0.9	0.9	*
		7692 .49046	7703 .36240	1591 .14714			
3	Yale 24 AGK2 +26°	7685 .56471	7692 .02095	7711 .41434	0.4	0.8	
		7692 .48760	7703 .35540	1591 .15700			
4	Yale 24	7717 .57246	7724 .49613	7727 -.06859			
		7717 .55517	7724 .50894	7727 -.06411			
5	Yale 24	7717 .55517	7724 .50894	7727 -.06411			
		1506 .55468	1525 .24592	1510 .19940			
6	AGK2 +35°, +36°	1507 .35286	1525 .61532	1526 .03182	0.0	0.2	
		1506 .51791	1525 .26431	1510 .21778			
7	AGK2 +35°, +36°	1507 .33558	1525 .59683	1526 .06759	0.1	0.0	
		1738 .30745	1633 .40321	1634 .28934			
8	AGK2 +38°, +39°	1738 .30745	1633 .40321	1634 .28934			b, e
		1738 .31481	1633 .37073	1634 .31446			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos \delta$	$\Delta\delta$	Note
<i>1965 VIII Ikeya-Seki</i>							
1	Yale 16	3562 .80973	3569 .13391	3576 .05636	0".8	0".1	<i>b, d</i>
		3553 .27392	3565 .48147	3576 .24461			
2	Yale 16	3562 .79751	3569 .14028	3576 .06221	0.8	0.6	<i>d</i>
		3553 .26984	3565 .48054	3576 .24962			
3	Yale 16	3562 .79569	3569 .14062	3576 .06369	0.3	0.1	<i>d</i>
		3553 .26925	3565 .48013	3576 .25062			
4	Yale 16	3587 .24118	3588 .32680	3607 .43202	0.5	0.1	<i>d</i>
		3588 .24295	3541H .45642	3608 .30063			
5	Yale 16	3587 .23965	3588 .32453	3607 .43582	0.6	0.1	<i>d</i>
		3588 .23884	3541H .45706	3608 .30410			
6	Yale 16	3587 .23553	3588 .31779	3607 .44668	0.4	0.4	<i>d</i>
		3588 .22716	3541H .45900	3608 .31384			
7	Yale 16	3587 .23301	3588 .31692	3607 .45007	0.9	0.2	<i>d</i>
		3588 .22414	3541H .45856	3608 .31730			
8	Yale 11	3734 .34523	3739 .66499	3745 -.01022	0.3	0.4	<i>d</i>
		3734 .33951	3740 .69297	3747 -.03248			
9	Tacubaya VI -11 ^o Plate No. 1581	144 .21760	171 .33478	173 .44762	1.3	0.2	<i>d</i>
		143 .30146	172 .42741	179 .27113			
10	Yale 11	3734 .33677	3739 .63314	3745 .03009	0.1	0.3	<i>d</i>
		3734 .31963	3740 .69322	3747 -.01285			
11	Yale 11	3734 .32634	3739 .58765	3745 .08601	0.5	0.3	<i>d</i>
		3734 .29304	3740 .69269	3747 .01427			
12	Yale 11	3734 .32428	3739 .58067	3745 .09505	0.3	0.1	<i>d</i>
		3734 .28877	3740 .69308	3747 .01815			
13	Tacubaya V -12 ^o Plate No. 1144	234 .20281	250 .61363	258 .18356	0.2	1.5	<i>d</i>
		238 .30443	245 .34937	261 .34620			
14	Yale 11	3765 .38405	3787 .42751	3793 .18844	0.9	1.3	<i>d</i>
		3764 .24792	3785 .54458	3794 .20750			
15	Yale 11	3765 .37925	3787 .41314	3793A .18961	0.7	0.8	<i>d</i>
		3764 .24313	3785 .54804	3794 .20883			
16	Yale 11	3956 .71644	3955 .24041	3959 .04315			<i>d</i>
17	Yale 11	3956 .72247	3955 .21163	3959 .06590			<i>d</i>
18	Yale 11	3956 .72538	3955 .19468	3959 .07994	0.0	0.0	<i>d</i>
		3956 .73192	3955 .21884	3961 .04924			
19	Yale 11	3956 .73774	3955 .13912	3959 .12314			<i>d</i>
20	Yale 11	3956 .74105	3955 .12019	3959 .13876			<i>d</i>
21	Yale 13 Part II	7470G .08295	7482 .50407	7490 .41298	0.6	0.4	<i>d</i>
		7464G .45318	7491 .24800	7502 .29882			
22	Yale 13 Part II	7470G .14896	7482 .49506	7490 .35598	1.2	0.4	<i>d, g</i>
		7464G .48499	7491 .24037	7502 .27464			
<i>1965 IX Alcock</i>							
1	AGK2 +34 ^o	1532 .53025	1533 .49514	1535 -.02539	0.9	0.3	<i>a</i>
		1530 .20950	1533 .49567	1534 .29483			
2	AGK2 +32 ^o , +33 ^o	1482 .09425	1500 .17755	1485 .72820	0.7	0.8	
		1495 .22516	1487 .42294	1503 .35190			
3	AGK2 +32 ^o , +33 ^o	1482 .09122	1500 .09092	1485 .81786	0.7	0.9	
		1495 .18476	1487 .46406	1503 .35118			
4	AGK2 +31 ^o , +32 ^o	1490 .09409	1491 .31464	1494 .59127	0.1	0.0	
		1487 .21816	1491 .42898	1497 .35286			
5	AGK2 +31 ^o , +32 ^o	1490 .12699	1491 .16178	1494 .71123	0.1	0.9	
		1487 .26877	1491 .30904	1497 .42219			
6	AGK2 +30 ^o	1588 .73428	1590 .15584	1592 .10988	0.7	0.5	
		1585 .36229	1587 .22476	1594 .41295			
7	AGK2 +30 ^o , +29 ^o	1679 .27500	1681 .53237	1598 .19263			
8	AGK2 +30 ^o , +29 ^o	1679 .25287	1681 .55937	1598 .18776			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos \delta$	$\Delta\delta$	Note
9	Yale 24 AGK2 +26°	8331 .55446	8338 .18923	8368G .25631	0.7	0.2	
		8338 .41045	1725 .42973	1727 .15982			
10	Yale 24 AGK2 +26°	8331 .55967	8338 .17337	8368G .26696	0.6	0.1	c, e
		8338 .39035	1725 .43839	1727 .17126			
11	Yale 22 AGK2 +7°	2549 .39696	8999 .32281	9013 .28023	0.1	0.7	a, c
		8970 .22860	8999 .55595	2555 .21545			
12	Yale 22 AGK2 +7°	2549 .34957	8999 .37489	9013 .27554	0.1	0.6	a, c
		8970 .19604	8999 .59100	2555 .21296			

1966 II Barbon

1	SAO 3 Star Catalog	128934 .26506	128978 .40393	128986 .33101	2.0	0.1	a, c
		128943 .27302	128958 .13609	128987 .59089			
2	SAO 3 Star Catalog	128943 .27818	128958 .13167	128987 .59015	0.2	1.1	a, c
		128934 .26543	128978 .41520	128986 .31937			
3	SAO 3 Star Catalog	128937 .56757	128947 .18622	128973 .24621	0.2	0.2	
		128923 .37206	128945 .24529	128971 .38265			
4	SAO 3 Star Catalog	128937 .57841	128947 .17595	128973 .24564	0.3	0.6	
		128923 .37858	128945 .23802	128971 .38340			

1966 III P/Van Biesbroeck

1	SAO 3 Star Catalog	161693 .21294	161715 .47583	161768 .31123	0.3	0.2	b
		161695 .14194	161710 .62455	161786 .23351			
2	SAO 3 Star Catalog	161693 .21528	161715 .47445	161768 .31027	0.1	0.0	
		161695 .14311	161710 .62473	161786 .23216			
3	SAO 3 Star Catalog	161693 .34308	161715 .38526	161768 .27166	0.3	0.5	a
		161695 .21392	161710 .61387	161786 .17221			
4	SAO 3 Star Catalog	161693 .34913	161715 .38145	161768 .26942	0.3	0.0	a
		161695 .21699	161710 .61398	161786 .16903			
5	SAO 3 Star Catalog	161693 .35304	161715 .37871	161768 .26825	0.1	0.1	a, c
		161695 .21918	161710 .61367	161786 .16715			
6	SAO 3 Star Catalog	161687 .43123	161693 .44659	161723 .12218	0.4	0.1	
		161651 .27442	161695 .35928	161710 .36630			
7	SAO 3 Star Catalog	161687 .43669	161693 .44588	161723 .11743	0.1	0.2	
		161651 .27818	161695 .35861	161710 .36321			
8	SAO 3 Star Catalog	161465 .37283	161490 .21031	161521 .41686	1.0	0.6	
		161459 .26524	161487 .41535	161537 .31941			
9	SAO 3 Star Catalog	161465 .37830	161490 .21198	161521 .40972	0.7	0.1	
		161459 .27099	161487 .41324	161537 .31577			
10	SAO 3 Star Catalog	161465 .48761	161490 .26826	161521 .24413	0.3	0.6	
		161459 .41417	161487 .34295	161537 .24288			
11	SAO 3 Star Catalog	161465 .49457	161490 .27021	161521 .23522	0.4	0.1	
		161459 .42113	161487 .34064	161537 .23823			
12	SAO 3 Star Catalog	161455 .27736	161487 .48010	161490 .24254	0.0	0.6	
		161459 .46460	161465 .10236	161498 .43304			
13	SAO 3 Star Catalog	161455 .28676	161487 .47407	161490 .23917	0.0	0.3	
		161459 .47018	161465 .10519	161498 .42463			
14	SAO 3 Star Catalog	161455 .48108	161487 .31844	161490 .20048	0.1	0.0	
		161459 .64628	161465 .08373	161498 .26999			
15	SAO 3 Star Catalog	161455 .49583	161487 .30708	161490 .19709	0.1	0.7	e
		161459 .65935	161465 .08268	161498 .25797			
16	SAO 3 Star Catalog	161455 .69248	161487 .14664	161490 .16088	0.3	0.8	
		161459 .84316	161465 .05374	161498 .10310			
17	SAO 3 Star Catalog	161455 .70270	161487 .13852	161490 .15878	0.7	0.7	
		161459 .85231	161465 .05297	161498 .09472			
18	SAO 3 Star Catalog	161414 .33611	161438 .36896	161469 .29493	0.5	1.1	
		161414 .26893	161437 .42587	161462 .30520			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos \delta$	$\Delta\delta$	Note
19	SAO 3 Star Catalog	161414 .33879	161438 .36772	161469 .29349	0.5	1.0	
		161414 .27195	161437 .42437	161462 .30368			
20	SAO 3 Star Catalog	161414 .48695	161438 .29231	161469 .22074	0.5	0.6	
		161414 .43677	161437 .33461	161462 .22862			
21	SAO 3 Star Catalog	161414 .49427	161438 .28857	161469 .21716	0.3	0.6	
		161414 .44496	161437 .33020	161462 .22484			
22	SAO 3 Star Catalog	161320 .18113	161368 .54973	161403 .26914	0.0	0.3	c, e
		161340 .41780	161374 .22171	161395 .36049			
23	SAO 3 Star Catalog	161320 .17675	161368 .55685	161403 .26640	0.5	0.8	c, e
		161340 .41760	161374 .21887	161395 .36353			

1966 V Kilston

1	SAO 2 Star Catalog	85534 .28230	85570 .48062	85597 .23708	0.1	0.1	
		85533 .18078	85560 .53035	85599 .28887			
2	SAO 2 Star Catalog	85534 .28043	85570 .48510	85597 .23447	0.4	0.5	
		85533 .18271	85560 .52626	85599 .29103			
3	SAO 2 Star Catalog	85534 .25981	85570 .53567	85597 .20452	0.1	0.2	
		85533 .20566	85560 .47753	85599 .31681			
4	SAO 2 Star Catalog	85534 .25764	85570 .54035	85597 .20201	0.4	0.1	
		85533 .20767	85560 .47297	85599 .31936			
5	SAO 2 Star Catalog	103402 .34958	103437 .29305	103458 .35737	0.5	0.1	
		103415 .65907	103445 .17806	103462 .16287			
6	SAO 2 Star Catalog	103402 .34932	103437 .28918	103458 .36150	0.2	0.2	
		103415 .65928	103445 .17215	103462 .16857			
7	SAO 2 Star Catalog	123294 .33330	123312 .29963	123340 .36707	0.1	0.2	
		123281 .26361	123327 .31889	123331 .41750			
8	SAO 2 Star Catalog	123294 .32096	123312 .30915	123340 .36989	0.1	0.3	
		123281 .25695	123327 .32746	123331 .41559			
9	SAO 2 Star Catalog	123294 .31143	123312 .31609	123340 .37248	0.6	0.2	
		123281 .25184	123327 .33398	123331 .41418			

1967 III Wild

1	SAO 1 Star Catalog	5728 .39260	5765 .10810	5781 .49930	0.0	0.4	
		5714 .11591	5755 .27300	5771 .61109			
2	SAO 1 Star Catalog	5728 .41898	5765 .27330	5781 .30772	0.4	0.2	
		5714 .23971	5755 .11930	5771 .64099			
3	SAO 1 Star Catalog	5728 .42260	5765 .28729	5781 .29011	0.4	0.2	
		5714 .25155	5755 .10652	5771 .64193			
4	SAO 1 Star Catalog	5714 .38060	5765 .27276	5775 .34664	0.3	0.2	
		5727 .22279	5729 .26393	5771 .51328			
5	SAO 1 Star Catalog	5714 .38811	5765 .29436	5775 .31753	0.3	0.2	
		5727 .21163	5729 .28802	5771 .50035			
6	SAO 1 Star Catalog	57697 .29014	57727 .41381	57756 .29605	0.0	0.3	
		57712 .38963	57714 .38860	57787 .22177			
7	SAO 1 Star Catalog	57697 .22680	57727 .54038	57756 .23282	0.1	0.3	
		57712 .48492	57714 .29328	57787 .22180			
8	SAO 1 Star Catalog	57697 .16048	57727 .67490	57756 .16462	0.3	0.2	
		57712 .58651	57714 .19247	57787 .22102			
9	SAO 2 Star Catalog	76992 .41312	77002 .06584	77014 .52104	5.6	0.4	a
		76979 .41741	77009 .27000	77031 .31259			
10	SAO 2 Star Catalog	76992 .39961	77002 .08491	77014 .51548	5.5	0.4	a
		76979 .41072	77009 .28420	77031 .30508			
11	SAO 2 Star Catalog	76992 .38345	77002 .10811	77014 .50844	5.3	0.1	a
		76979 .40264	77009 .30138	77031 .29598			
12	SAO 2 Star Catalog	76994 .40539	77022 .14933	77023 .44528	0.3	0.3	
		76980 .31448	77003 .33273	77033 .35279			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
13	SAO 2 Star Catalog	76994 .40438	77022 .11618	77023 .47944	0.3	0.3	
		76980 .33028	77003 .30702	77033 .36270			
14	SAO 2 Star Catalog	76994 .40476	77022 .08168	77023 .51356	0.1	0.0	
		76980 .34693	77003 .28069	77033 .37238			

1967 IV Seki

1	SAO 2 Star Catalog	88379 .32047	88450 .36964	88452 .30989	0.0	0.6	
		88395 .36294	88411 .35160	88485 .28546			
2	SAO 2 Star Catalog	88379 .29091	88450 .40378	88452 .30531	0.3	0.6	
		88395 .35796	88411 .52648	88485 .31556			
3	SAO 2 Star Catalog	88379 .25007	88450 .45295	88452 .29698	0.4	0.5	
		88395 .34954	88411 .29371	88485 .35675			
4	SAO 2 Star Catalog	88379 .22758	88450 .48089	88452 .29153	0.2	0.4	
		88395 .34428	88411 .27643	88485 .37929			
5	SAO 2 Star Catalog	88379 .18661	88450 .52960	88452 .28379	0.3	0.6	
		88395 .33633	88411 .24287	88485 .42080			

1967 V P/Tuttle

1	SAO 2 Star Catalog	74383 .14830	74395 .49983	74397 .35187	0.7	0.2	b
		74381 .51264	74411 .47025	74421 .01711			
2	SAO 2 Star Catalog	74383 .13020	74395 .52074	74397 .34906	0.7	0.2	b
		74381 .50798	74411 .46733	74421 .02469			
3	SAO 2 Star Catalog	75175 .20954	92822 .49389	92838 .29657	0.4	0.5	b
		75175 .29071	92822 .47913	92846 .23016			
4	SAO 2 Star Catalog	75175 .19237	92822 .48927	92836 .31836	0.5	0.5	b
		75175 .27951	92822 .47342	92846 .24707			
5	SAO 2 Star Catalog	75175 .18401	92822 .48962	92838 .32637	0.3	0.4	
		75175 .27328	92822 .47340	92846 .25332			
6	SAO 2 Star Catalog	93060 .13568	93074 .47320	93084 .39112	0.7	0.2	
		93060 .23754	93066 .33483	93094 .42763			
7	SAO 2 Star Catalog	93060 .11900	93074 .45024	93084 .43076	0.7	0.2	
		93060 .24878	93066 .30257	93094 .44865			
8	SAO 2 Star Catalog	93060 .11240	93074 .44296	93084 .44464	0.1	0.1	
		93060 .25196	93066 .29194	93094 .45610			

1967 X P/Tempel 2

1	SAO 3 Star Catalog	142314 .33259	142328 .19986	142352 .46755	0.5	0.3	
		142314 .33517	142340 .40642	142351 .25841			
2	SAO 3 Star Catalog	142314 .32681	142328 .20345	142352 .46974	0.2	0.6	
		142314 .33130	142340 .40708	142351 .26162			
3	SAO 3 Star Catalog	142351 .74947	142366 .06348	142371 .18705	0.0	0.3	
		142328 .30714	142356 .20577	142371 .48709			
4	SAO 3 Star Catalog	142351 .74683	142366 .07495	142371 .17822	0.3	0.3	
		142328 .30571	142356 .20970	142371 .48459			
5	SAO 3 Star Catalog	161596 .35259	161597 .37103	161653 .27638	0.1	1.1	
		161595 .45474	161620 .38972	161651 .15554			
6	SAO 3 Star Catalog	161596 .37419	161597 .34760	161653 .27821	0.2	1.2	
		161595 .47067	161620 .36155	161651 .16778			

1967 XI P/Reinuth 2

1	SAO 2 Star Catalog	128090 .27861	128095 .27658	128115 .44481	0.7	0.2	
		128084 .05842	128102 .56750	128109 .37408			
2	SAO 2 Star Catalog	128090 .29233	128095 .27594	128115 .43173	1.0	0.7	c
		128084 .07567	128102 .56010	128109 .36423			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
1967 XIV P/Wirtanen							
1	SAO 3 Star Catalog	130780 .51124 130779 .21526	130800 .11313 130787 .42126	130816 .37563 130816 .36348	0.4	0.9	c
2	SAO 3 Star Catalog	130780 .52274 130779 .21166	130800 .10165 130787 .43352	130816 .37561 130816 .35482	0.9	0.2	
3	SAO 2 Star Catalog	111349 .22521 111327 .25297	111350 .58823 111350 .52592	111360 .18656 111379 .22111	0.2	0.2	
4	SAO 2 Star Catalog	111349 .25330 111327 .27058	111350 .58088 111350 .50687	111360 .16582 111379 .22255	0.2	0.4	
1968 I Ikeya-Seki							
1	SAO 2 Star Catalog	121794 .25299 121792 .28594	121833 .40932 121817 .34339	121841 .33769 121863 .37067	0.2	0.3	
2	SAO 2 Star Catalog	121794 .25102 121792 .28311	121833 .41207 121817 .34625	121841 .33691 121863 .37064	0.5	0.2	
3	SAO 2 Star Catalog	121794 .24911 121792 .27962	121833 .41530 121817 .34981	121841 .33559 121863 .37057	0.2	0.2	
4	SAO 2 Star Catalog	121794 .24701 121792 .27608	121833 .41869 121817 .35351	121841 .33430 121863 .37041	0.2	0.1	
5	SAO 2 Star Catalog	121817 .45728 121793 .31626	121850 .30885 121855 .44669	121863 .23387 121863 .23705	0.8	0.1	
6	SAO 2 Star Catalog	121817 .45353 121793 .31423	121850 .31583 121855 .45329	121863 .23064 121863 .23248	0.9	0.1	
7	SAO 2 Star Catalog	121817 .45161 121793 .31314	121850 .31973 121855 .45703	121863 .22866 121863 .22983	1.3	0.1	
1968 II P/Schwassmann-Wachmann							
1	SAO 2 Star Catalog AGK2 +21 ^o	78056 .50106 625 .28495	632 .32458 78077 .37679	78077 .17436 634 .33826	0.2	0.1	
2	SAO 2 Star Catalog AGK2 +21 ^o	78056 .51595 625 .28923	632 .31915 78077 .37258	78077 .16490 634 .33819	0.1	0.0	c, e
1968 IV Tago-Honda-Yamamoto							
1	SAO 1 Star Catalog	12813 .44763 12809 .42910	12828 .44182 12831 .45870	12848 .11055 12848 .11220	0.1	0.3	
2	SAO 1 Star Catalog	12813 .44424 12809 .42540	12828 .43150 12831 .44825	12848 .12426 12848 .12635	0.2	0.4	
3	SAO 1 Star Catalog	12813 .41788 12809 .39569	12828 .34795 12831 .36479	12848 .23417 12848 .23952	0.4	0.0	
4	SAO 1 Star Catalog	12813 .41098 12809 .38831	12828 .33009 12831 .34680	12848 .25893 12848 .26489	0.5	0.1	
5	SAO 1 Star Catalog	12955 .15507 12968 .13037	12984 .26236 12978 .19996	12985 .58257 12985 .66967	0.0	0.1	
6	SAO 1 Star Catalog	12955 .14974 12968 .12376	12984 .25923 12978 .19671	12985 .59103 12985 .67953	0.1	0.2	
7	SAO 1 Star Catalog	12955 .07652 12968 .03200	12984 .22390 12978 .15635	12985 .69958 12985 .81165	0.0	0.1	
8	SAO 1 Star Catalog	12955 .06722 12968 .02042	12984 .21916 12978 .15107	12985 .71362 12985 .82851	0.0	0.1	
9	SAO 1 Star Catalog	25010 .19066 25043 .65797	25054 .47089 25049 .14931	25056 .33845 25069 .19272	0.2	0.2	b, d
10	SAO 1 Star Catalog	25010 .18264 25043 .65900	25054 .48810 25049 .13927	25056 .32918 25069 .20173	0.0	0.1	b, d

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
1968 V Whitaker-Thomas							
1	SAO 1 Star Catalog AGK2 +31°	1342 .51889 64712 .52297	64712 .16391 64723 .43451	64732 .31720 64748 .04252	0".0	0".8	c
2	SAO 1 Star Catalog AGK2 +31°	1342 .51540 64712 .52590	64712 .16925 64723 .43180	64732 .31535 64748 .04230	0.2	0.5	c
1968 VI Honda							
1	SAO 1 Star Catalog	40101 .21315 40149 .40024	40082 .47941 40065 .27280	40168 .30744 40106 .32696	0.5	0.2	
2	SAO 1 Star Catalog AGK2 +47°	40092 .69260 507 .29313	40113 .10527 40118 .36931	40131 .20213 40141 .33756	0.1	0.4	
3	SAO 1 Star Catalog AGK2 +47°	40092 .68576 507 .29872	40113 .12516 40118 .34735	40131 .18908 40141 .35393	0.3	0.6	
4	SAO 1 Star Catalog AGK2 +51°	463 .45378 25024 .41309	25046 .13606 466 .25266	25079 .41016 25073 .33424	0.2	0.1	
5	SAO 1 Star Catalog AGK2 +51°	463 .44209 25024 .41022	25046 .15075 466 .27527	25079 .40716 25073 .31451	0.1	0.8	
6	SAO 1 Star Catalog	25046 .36386 25035 .36035	25055 .37838 25055 .42438	25066 .25776 25079 .21527	0.2	0.1	
7	SAO 1 Star Catalog	25046 .33729 25035 .33421	25055 .42524 25055 .46686	25066 .23747 25079 .19893	0.1	0.3	
8	SAO 1 Star Catalog AGK2 +54°	24993 .29712 25006 .44297	25009 .29012 25029 .16447	455 .41276 454 .39256	0.1	0.1	
9	SAO 1 Star Catalog AGK2 +54°	24993 .24586 25006 .41314	25009 .36576 25029 .21719	455 .38838 454 .36967	0.1	0.1	
10	SAO 1 Star Catalog AGK2 +54°	24993 .17431 25006 .37469	25009 .47397 25029 .29069	455 .35172 454 .33462	0.2	0.2	b
11	SAO 1 Star Catalog AGK2 +65°	13284 .61664 13278 .63618	13294 .21681 277 .22316	13301 .16655 13305 .14066	0.5	0.1	
12	SAO 1 Star Catalog AGK2 +65°	13284 .62776 13278 .64129	13294 .19862 277 .20709	13301 .17362 13305 .15162	0.4	0.3	
13	SAO 1 Star Catalog AGK2 +65°	13284 .64116 13278 .64738	13294 .17595 277 .18733	13301 .18289 13305 .16529	0.4	0.2	
14	SAO 1 Star Catalog AGK2 +65°	13284 .65101 13278 .65188	13294 .15816 277 .17223	13301 .19083 13305 .17589	0.9	0.2	
1968 VII Bally-Clayton							
1	SAO 1 Star Catalog AGK2 +31°	66093 .48671 66089 .16096	1527 .17702 66093 .60730	66112 .33627 66139 .23174	0.6	0.5	b
2	SAO 1 Star Catalog AGK2 +31°	66093 .48519 66089 .16123	1527 .17729 66093 .60628	66112 .33752 66139 .23249	0.6	0.3	
1969 I Thomas							
1	SAO 1 Star Catalog	720 .33378 716 .35114	730 .31756 724 .21092	765 .34866 765 .43794	0.2	0.4	c
2	SAO 1 Star Catalog	720 .33309 716 .35078	730 .31915 724 .21182	765 .34776 765 .43740	0.3	0.2	
3	SAO 1 Star Catalog	720 .28915 716 .31338	730 .49258 724 .34743	765 .21827 765 .33919	0.2	0.5	
4	SAO 1 Star Catalog	720 .28830 716 .31268	730 .49618 724 .35018	765 .21552 765 .33714	0.1	0.7	
5	SAO 1 Star Catalog	720 .12330 716 .24390	724 .51486 724 .60154	730 .36184 751 .15456	0.3	0.1	

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
1969 V P/Honda-Mrkos-Pajdušáková							
1	SAO 2 Star Catalog	118192 .40461	118202 .24005	118213 .35534	0".3	0".2	<i>a, d</i>
		118179 .30059	118213 .41444	118214 .28497			
2	SAO 2 Star Catalog	118192 .39240	118202 .24722	118213 .36038	0.4	0.0	<i>a, d</i>
		118179 .29519	118213 .40964	118214 .29517			
3	SAO 2 Star Catalog	118192 .37233	118202 .25913	118213 .36854	0.2	0.4	<i>a, d</i>
		118179 .28615	118213 .40195	118214 .31190			
1969 VI P/Faye							
1	SAO 2 Star Catalog	94382 .15568	94429 .22205	94444 .62227	0.2	0.1	
		94417 .12285	94429 .58283	94434 .29432			
2	SAO 2 Star Catalog	94382 .14948	94429 .23527	94444 .61525	0.3	0.4	
		94417 .11009	94429 .58064	94434 .30927			
3	SAO 2 Star Catalog	94382 .58638	94429 .14319	94444 .26543	0.1	0.0	<i>b</i>
		94417 .63272	94429 .29826	94434 .07802			
4	SAO 2 Star Catalog	94382 .59124	94429 .12406	94444 .28470	0.1	0.1	<i>b</i>
		94417 .61587	94429 .29222	94434 .09191			
5	SAO 2 Star Catalog	94382 .59233	94429 .11771	94444 .28996	0.1	0.0	
		94417 .61358	94429 .29079	94434 .09563			
1969 VII Fujikawa							
1	SAO 2 Star Catalog	95082 .20567	95086 .37752	95127 .41681	0.1	0.3	
		95049 .17895	95091 .44656	95142 .37449			
2	SAO 2 Star Catalog	118118 .26326	118151 .48351	118154 .25323	0.1	0.2	<i>a, d</i>
		118117 .20670	118146 .36483	118151 .42847			
3	SAO 2 Star Catalog	118118 .25285	118151 .48308	118154 .26407	0.1	0.3	<i>a, d</i>
		118117 .19531	118146 .36933	118151 .43536			
4	SAO 2 Star Catalog	118118 .23775	118151 .48389	118154 .27836	0.2	0.3	<i>a, d</i>
		118117 .17878	118146 .37473	118151 .44649			
1969 IX Tago-Sato-Kosaka							
1	SAO 3 Star Catalog	141167 .40007	141182 .07230	141196 .52763	0.5	0.4	
		141165 .39809	141182 .22292	141199 .37899			
2	SAO 3 Star Catalog	141166 .39035	141196 .18038	141205 .42927	0.4	0.3	
		141165 .42854	141199 .04074	141205 .53072			
3	SAO 3 Star Catalog	141166 .38503	141205 .20787	141223 .40710	0.1	0.0	<i>c</i>
		141169 .32536	141205 .58099	141230 .09365			
4	SAO 3 Star Catalog	141169 .32794	141205 .11765	141230 .52441	0.2	0.7	<i>c</i>
		141168 .14480	141205 .36944	141218 .48576			
5	SAO 2 Star Catalog	109715 .26799	109741 .14101	109745 .59100	1.3	0.7	
		109712 .37040	109746 .22034	109751 .40926			
6	SAO 2 Star Catalog	109715 .25354	109741 .18485	109745 .56161	0.2	0.4	
		109712 .36336	109746 .19654	109751 .44010			
7	SAO 2 Star Catalog	109715 .20475	109741 .32782	109745 .46743	0.8	0.0	
		109712 .34055	109746 .11960	109751 .53985			
8	SAO 2 Star Catalog	109810 .24537	109820 .44801	109833 .30662	1.1	0.0	
		109791 .27562	109832 .53283	109833 .19155			
9	SAO 2 Star Catalog	109810 .24445	109820 .42886	109833 .32669	1.1	0.0	
		109791 .26919	109832 .50315	109833 .22766			
10	SAO 1 Star Catalog	55623 .65301	55657 .12496	55707 .22203	0.7	0.1	
		55592 .36768	55657 .16348	55682 .46884			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
11	SAO 1 Star Catalog	55623 .64171	55657 .13646	55707 .22183	0".8	0".2	
		55592 .36130	55657 .17172	55682 .46697			
12	SAO 1 Star Catalog	55623 .55596	55657 .22486	55707 .21918	0.0	0.6	
		55592 .31290	55657 .23498	55682 .45212			
13	SAO 1 Star Catalog	55623 .51285	55657 .26989	55707 .21726	0.0	0.6	e
		55592 .28866	55657 .26778	55682 .44356			
1970 II Bennett							
1	SAO 1 Star Catalog	5316 .84398	5333 .09012	5347 .06590	0.8	0.5	
		5291 .23083	5330 .44275	5333 .32642			
2	SAO 1 Star Catalog	5316 .48782	5333 .48213	5347 .03005	0.6	0.2	
		5291 .13772	5330 .24735	5333 .61493			
3	SAO 1 Star Catalog	5316 .47085	5333 .49826	5347 .03089	0.3	0.4	
		5291 .13206	5330 .24086	5333 .62708			
1970 III Kohoutek							
1	SAO 2 Star Catalog	86793 .22699	86798 .58237	86799 .19064	0.4	0.5	e
		86760 .11555	86792 .54772	86827 .33673			
2	SAO 2 Star Catalog	86793 .46981	86798 .32053	86799 .20966	0.3	1.0	e
		86760 .13322	86792 .58094	86827 .28584			
1970 X Suzuki-Sato-Seki							
1	SAO 2 Star Catalog	103242 .56763	103266 .33846	103279 .09391	0.1	0.2	
		103238 .26699	103242 .53335	103307 .19966			
1970 XV Abe							
1	SAO 1 Star Catalog	55436 .37411	55444 .15902	55474 .46687	0.3	0.1	
		55436 .55196	55475 .37852	55478 .06952			
2	SAO 1 Star Catalog	55436 .42005	55444 .10537	55474 .47458	0.2	0.5	
		55436 .55676	55475 .34396	55478 .09928			
3	SAO 1 Star Catalog	55436 .44066	55444 .08186	55474 .47748	0.1	0.7	
		55436 .55924	55475 .32855	55478 .11221			
4	SAO 1 Star Catalog	55436 .46055	55444 .06042	55474 .47903	0.0	0.4	b
		55436 .56244	55475 .31429	55478 .12327			
5	SAO 1 Star Catalog	55400 .26241	55421 .60779	55454 .12980	0.2	0.1	
		55394 .54294	55443 .24030	55456 .21676			
6	SAO 1 Star Catalog	55400 .24167	55421 .64114	55454 .11719	0.0	0.1	
		55394 .55354	55443 .21808	55456 .22838			
7	SAO 1 Star Catalog	55400 .21031	55421 .69057	55454 .09912	0.0	0.1	
		55394 .56891	55443 .18442	55456 .24667			
8	SAO 1 Star Catalog	55400 .19834	55421 .70886	55454 .09280	0.4	0.3	
		55394 .57450	55443 .17177	55456 .25373			
9	SAO 1 Star Catalog	55400 .18982	55421 .72294	55454 .08724	0.1	0.1	
		55394 .57905	55443 .16242	55456 .25853			
10	SAO 1 Star Catalog	37869 .23501	37907 .37340	55439 .39159	0.5	0.4	
		37868 .37808	37930 .30146	55439 .32046			
11	SAO 1 Star Catalog	37869 .22732	37907 .39940	55439 .37328	0.6	0.4	
		37868 .38012	37930 .33185	55439 .28801			
12	SAO 1 Star Catalog	37869 .21953	37907 .42594	55439 .35453	1.0	0.3	
		37868 .38236	37930 .36287	55439 .25477			
13	SAO 1 Star Catalog	37869 .21102	37907 .45285	55439 .33613	1.1	0.3	
		37868 .38392	37930 .39456	55439 .22152			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependencies			$\Delta\alpha \cos\delta$	$\Delta\delta$	Note
14	SAO 1 Star Catalog	10003 .37224	10039 .40245	10080 .22531	0.3	0.1	
		9992 .43504	10053 .23096	10080 .33400			
15	SAO 1 Star Catalog	10003 .39665	10039 .39717	10080 .20618	0.6	0.2	
		9992 .45595	10053 .21821	10080 .32584			
16	SAO 1 Star Catalog	10003 .40909	10039 .39476	10080 .19615	0.3	0.5	
		9992 .46681	10053 .21180	10080 .32139			
17	SAO 1 Star Catalog	17772 .14933	17776 .22202	17813 .62865	0.3	0.7	b
		17767 .18651	17774 .26800	17819 .54559			
18	SAO 1 Star Catalog	17772 .20380	17776 .20766	17813 .58854	0.1	6.1	b
		17767 .23149	17774 .25244	17819 .51607			
19	SAO 1 Star Catalog	17772 .24026	17776 .19580	17813 .56394	0.3	0.1	
		17767 .25900	17774 .24308	17819 .49792			
20	SAO 1 Star Catalog	17675 .35102	17676 .34472	17706 .30425	0.1	0.4	
		17675 .44702	17677 .27245	17709 .28053			
21	SAO 1 Star Catalog	17675 .32016	17676 .42622	17706 .25362	0.6	0.0	
		17675 .43165	17677 .33709	17709 .23126			
22	SAO 1 Star Catalog	17675 .29768	17676 .48376	17706 .21856	0.9	0.2	
		17675 .42036	17677 .38257	17709 .19707			
23	SAO 1 Star Catalog	17675 .25205	17676 .60378	17706 .14417	0.8	0.3	
		17675 .39799	17677 .47791	17709 .12410			
24	SAO 1 Star Catalog	17579 .36178	17580 .26483	17641 .37339	0.7	0.1	
		17579 .36581	17611 .44123	17641 .19296			
25	SAO 1 Star Catalog	17579 .32846	17580 .30517	17641 .36637	0.7	0.1	
		17579 .33320	17611 .50825	17641 .15855			
26	SAO 1 Star Catalog	17579 .27390	17580 .37149	17641 .35461	0.4	0.0	
		17579 .27969	17611 .61848	17641 .10183			
27	SAO 1 Star Catalog	30423 .38528	17525 .40687	30459 .20785	0.1	0.3	
		30424 .44484	17525 .39138	17536 .16378			
28	SAO 1 Star Catalog	30423 .40509	17525 .39047	30459 .20444	0.1	0.1	
		30424 .46322	17525 .37779	17536 .15899			
29	SAO 1 Star Catalog	30423 .41701	17525 .37824	30459 .20475	1.2	0.7	
		30424 .47535	17525 .36719	17536 .15746			
30	SAO 2 Star Catalog	101896 .23413	101914 .43573	101946 .33014	0.2	0.6	
		101870 .16984	101924 .46672	101944 .36344			
31	SAO 2 Star Catalog	101896 .23682	101914 .43147	101946 .33171	0.2	0.3	
		101870 .17102	101924 .46315	101944 .36583			
32	SAO 2 Star Catalog	101896 .23959	101914 .42681	101946 .33360	0.5	1.1	
		101870 .17206	101924 .45972	101944 .36822			
33	SAO 2 Star Catalog	101896 .49094	101933 .31056	101946 .19850	0.2	0.2	
		101897 .42617	101914 .31765	101957 .25618			
34	SAO 2 Star Catalog	101896 .49035	101933 .31475	101946 .19490	0.4	0.0	
		101897 .42776	101914 .31501	101957 .25723			

1971 I P/Encke

1	SAO 2 Star Catalog	107091 .30148	107110 .39416	107130 .30436	0.2	0.4	c
		107091 .25767	107114 .68573	107132 .05660			
2	SAO 2 Star Catalog	107091 .34336	107110 .34702	107130 .30962	0.5	0.1	c
		107091 .28941	107114 .65128	107132 .05931			
3	SAO 2 Star Catalog	107023 .24574	107028 .20869	107057 .54557	0.6	0.2	c
		107000 .16062	107049 .51633	107056 .32305			
4	SAO 2 Star Catalog	106886 .20487	106888 .56461	106934 .23052	0.6	0.4	c
		106864 .27553	106904 .26685	106913 .45761			
5	SAO 2 Star Catalog	106886 .14975	106888 .65167	106934 .19858	0.1	0.2	c
		106864 .30791	106904 .22437	106913 .46772			
6	SAO 2 Star Catalog	106886 .13218	106888 .68462	106934 .18320	0.1	0.2	c
		106864 .32325	106904 .20637	106913 .47038			

Continuation Table 2

No.	Catalogue	Star Numbers and Dependences			$\Delta\alpha \cos \delta$	$\Delta\delta$	Note
1971 Toba							
1	SAO 2 Star Catalog	127307 .23562	127311 .44291	127343 .32147	0.0	1.1	
		127280 .33093	127334 .32256	127345 .34651			
2	SAO 2 Star Catalog	127307 .23148	127311 .45154	127343 .31698	1.2	0.6	
		127280 .33344	127334 .31655	127345 .35001			
3	SAO 2 Star Catalog	127307 .22621	127311 .45341	127343 .32038	0.1	0.4	
		127280 .33065	127334 .31645	127345 .35290			

Notes to Table 2

a – bad atmospherical condition; agitation,
b – measurement difficult, images of bad quality,
c – comet image extremely faint, measurement difficult,
d – comet low above horizon,
e – photographed through the veil of clouds,
f – exposure with short focal camera 11 cm *f*/4.5,
g – last position photographed with 60 cm *f*/5.5 reflector,
h – first position photographed with 30 cm *f*/5 astrograph.

Table 3

$\Delta\delta$ <	$\Delta\alpha \cos \delta$ <	0°.1	0°.2	0°.4	0°.6	0°.8	1°.0	1°.2	1°.4	1°.6	1°.8	2°.0	2°.0	Σ
0°.1		25	6	18	11	6	1	2	1	–	–	1	1	72
0°.2		11	8	11	7	7	4	–	1	1	–	–	–	50
0°.4		20	13	13	9	1	3	2	–	–	–	–	2	63
0°.6		6	5	10	3	3	2	1	–	–	–	–	–	30
0°.8		6	1	3	1	3	1	1	1	–	–	–	–	17
1°.0		1	–	3	–	1	1	–	–	–	–	–	–	6
1°.2		2	2	–	2	–	–	–	–	–	–	–	–	6
1°.4		–	–	–	–	1	1	–	–	–	–	–	–	2
1°.6		–	–	–	–	–	–	–	–	–	–	–	–	0
1°.8		–	–	–	–	–	–	–	–	–	–	–	–	0
2°.0		–	–	–	–	–	–	–	–	–	–	–	–	0
2°.0		1	–	–	–	–	–	–	–	–	–	–	–	1
Σ		72	35	58	33	22	13	6	3	1	0	1	3	247

Table 4

Definitive designation	Provisional designation	Name	Number of positions	Definitive designation	Provisional designation	Name	Number of positions
1963 VIII	1963d	Keams-Kwee	2	1968 II	1967i	P/Schwassmann-Wachmann	2
1964 III	1963i	P/Kopff	8	1968 IV	1968a	Tago-Honda-Yamamoto	10
1964 VIII	1964f	Ikeya	20	1968 V	1968b	Whitaker-Thomas	2
1964 IX	1964h	Everhart	9	1968 VI	1968c	Honda	14
1965 VIII	1965f	Ikeya-Seki	22	1968 VII	1968d	Bally-Clayton	2
1965 IX	1965h	Alcock	12	1969 I	1968j	Thomas	5
1966 II	1966c	Barbon	4	1969 V	1969e	P/Honda-Mrkos-Pajdusakova	3
1966 III	1965d	P/van Biesbroeck	23	1969 VI	1969a	P/Faye	5
1966 V	1966b	Kilston	9	1969 VII	1969d	Fujikawa	4
1967 III	1967c	Wild	14	1969 IX	1969g	Tago-Sato-Kosaka	13
1967 IV	1967b	Seki	5	1970 II	1969i	Bennett	3
1967 V	1967a	Tuttle	8	1970 III	1969b	Kohoutek	2
1967 X	1967d	P/Tempel 2	6	1970 X	1970m	Suzuki-Sato-Seki	1
1967 XI	1967e	P/Reinmuth 2	2	1970 XV	1970g	Abe	34
1967 XIV	1967k	P/Wirtanen	4	1971 II	1970l	P/Encke	6
1968 I	1967n	Ikeya-Seki	7	1971 V	1971a	Toba	3

Table 5

Name	Abbr.	Period	Exposures	Measurements	Reductions
M. Antal	A	1964-1971	247	262	63
A. Antalová	Aa	1964-1965	-	1	5
Š. Dendis	De	1965-1970	7	-	39
L. Petrik	Pe	1970	10	-	-
J. Zverko	Zv	1968	-	1	-

POZOROVANIA KOMÉT V OBSERVATÓRIU NA SKALNATOM PLESE V ROKOCH 1964-1971

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Resumé

V práci sú zhrnuté výsledky 264 fotografických pozičných pozorovaní 32 komét, získaných v Astronomickom ústave Slovenskej akadémie vied na Skalnatom Pleso v rokoch 1964–1971. Sledovanie pohybu komét patrí k stálym programom observatória v rámci výskumu medziplanetárnej hmoty. V podstate táto práca nadväzuje na súhrn výsledkov z pozorovaní komét na Skalnatom Pleso v rokoch 1946–1963 (Krešák, Antal 1966).

Pozorovací materiál sme získali dvoma prístrojmi: do novembra 1965 Zeissovým reflektorom 60 cm $f = 329$ cm a od roku 1966 astrografom 30 cm $f/5$. Použité fotografické platne boli prevažne značky ORWO, emulzie ZU 1, ZU 2, a NP 27. Snímky sme premeriavali na Zeissovom prístroji na meranie pravouhlých súradníc – Koordinatenmessgerät 30×30 . Kométa i referenčné hviezdy sa na každej platni merali niekoľkokrát v oboch súradniciach a na ďalší výpočet sa použili stredné hodnoty. Výber referenčných hviezd sa zameriaval predovšetkým na slabšie hviezdy so známymi vlastnými pohybmi a s vhodným rozložením v tesnej blízkosti kométy. Pri spracúvaní pozorovaní do roku 1966 sme používali Yalské katalógy, prípadne AGK₂ s katalógom vlastných pohybov hviezd EBL₂. Neskôr sa údaje o referenčných hviezdach preberali temer výlučne z hviezdnych katalógov Smithsonian Astrophysical Observatory. Okrem niekoľkých výnimiek sa poloha kométy určovala pomocou dvoch trojíc referenčných hviezd. Takto sme získali dve nezávislé určenia ekvatoreálnych súradníc kométy, ktoré popri kontrolnej funkcii poskytovali informáciu o presnosti meraní. Merania Schlesingerovou metódou dependencií sa redukovali prevažne na počítačoch ZRA 1 a GIER Ústavu technickej kybernetiky SAV v Bratislave.

Výsledky sú usporiadané do dvoch tabuliek. Tabuľka 1 obsahuje polohy komét, zoradených podľa definitívneho označenia. V prvom stĺpci je poradové číslo pozície, v ďalších stĺpcoch sú rektascenzia a deklinácia pre ekvinokcium 1950,0, dĺžka expozície v minútach a v posledných dvoch stĺpcoch mien pozorovateľov a počítačov (Obs. = pozorovateľ, M + R = meral a redukoval; malým písmenom c sú označené polohy redukované počítačom). Doplňujúce údaje k posledným dvom rubrikám obsahuje tabuľka 5. Tabuľka 2 má poradové čísla poloh v prvom stĺpci zhodné s predchádzajúcou. Ďalšie stĺpce obsahujú názov a číslo zväzku, resp. zónu použitého katalógu, čísla referenčných hviezd a k nim prislúchajúce dependencie. V posledných stĺpcoch sú rozdiely medzi polohami kométy z dvoch nezávislých trojuholníkov $\Delta \alpha \cos \delta$ a $\Delta \delta$ v oblúkových sekundách a napokon prípadné poznámky, ku ktorým sú vysvetlivky za tabuľkou 2. Tabuľka 3 informuje o presnosti meraní 247 poloh. Každá z nich bola zaradená do príslušného intervalu podľa veľkosti rozdielu $\Delta \alpha \cos \delta$ a $\Delta \delta$ dvoch nezávisle určených ekvatoreálnych súradníc z dvoch trojuholníkov referenčných hviezd. Z tabuľky vidieť, že viac ako polovica poloh má rozdiely v oboch súradniciach pod 0,5 a vyše 90 % poloh $\leq 1,0$. Tieto údaje hovoria v podstate o presnosti meraní referenčných hviezd. Presnosť polôh komét s jadrom alebo výraznou centrálnou kondenzáciou by vo väčšine prípadov mala byť pod 1 v oboch súradniciach pri pozorovaní zo 60 cm reflektora a pod 2 pri meraní z 30 cm astrografu. Pri slabých kométach bez jadra alebo centrálny kondenzácie dosahuje pravdepodobná chyba najviac dvojnásobnú hodnotu. O presnosti tohto predpokladu vyplýva z porovnania väčších sérií polôh s presnými efemeridami. V tabuľke 4 je zoznam pozorovaných komét a počet získaných polôh. Tabuľka 5 uvádza zoznam spolupracovníkov a podáva prehľad o ich účasti na pozorovaniach, meraniach a redukciami.

НАБЛЮДЕНИЯ КОМЕТ НА ОБСЕРВАТОРИИ СКАЛНАТЕ ПЛЕСО В 1964–1971 ГГ.

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Резюме

В работе содержатся результаты 264 фотографических положений 32 комет, полученных в 1964–1971 годах в Астрономическом институте Словацкой Академии наук, где исследование движения комет является одной из постоянных задач в программе изучения межпланетного вещества. Эта работа связана с результатами наблюдений комет на Скалнате Плесе в 1946–1963 гг. (Л. Кресак – М. Антал 1966).

Наблюдаемый материал получен на двух инструментах – 60 см цейсовском рефлекторе светосилой 1:5.5 (до ноября 1965г) и 30 см астрографе светосилой 1:5 (с 1966 г.). Были использованы фотографические пластинки преимущественно фирмы ОРВО эмульсий ЗУ 1, ЗУ 2 и НП 27. Снимки обрабатывались на цейсовском приборе для измерения прямоугольных координат Коомесс 30 × 30. Комета и опорные звезды измерялись на каждой пластинке несколько раз по координатам и в дальнейших вычислениях использовались их среднеарифметические значения. При выборе реперов отдавалось предпочтение слабым звёздам с известными собственными движениями, которые расположены в непосредственной близости с кометой. Для обработки наблюдений, выполненных до 1966 г., использовались в основном Ельские каталоги, а также АГК₂ с каталогом собственных движений звёзды ЕБЛ₂. В дальнейшем данные об опорных звёздах брались главным образом из звёздного каталога Сметсинианской астрофизической обсерватории. Кроме нескольких случаев для определения положения комет использовались два треугольника опорных звёзд. Таким образом получалось два независимых определения экваториальных координат кометы, которые, кроме взаимного контроля, давали информацию о точности измерений. Редукция измерений производилась на ЭВМ "ЗРА 1" и "ГИЕР" Института технической кибернетики Словацкой академии наук в Братиславе.

Результаты приведены в двух таблицах. Таблица 1 содержит положения комет, которые упорядочены, согласно их окончательным обозначениям. В первой колонке даны порядковые номера, положений, в дальнейших – середина экспозиций в МВ, прямое восхождение и склонение отнесенные к 1950.0 – длина экспозиций в минутах и в последних двух – сокращенное обозначение наблюдателей и вычислителей (Obs. – наблюдатели, M+R – сотрудники, участвовавшие в измерениях и вычислениях; малой буквой с обозначаются положения, вычисленные на машине). В таб. 5 даны дополнительные данные к последним двум колонкам. В таблице 2 в первом столбце даются те же порядковые номера положений комет, что и в таб. 1. Дальнейшие колонки содержат наименование и номер тома использованного каталога (в некоторых случаях и зона) номера опорных звёзд и относящиеся к ним зависимости. В последних столбцах приведены разницы между положениями кометы, полученные из двух независимых треугольников $\Delta \alpha \cos \delta$ и $\Delta \delta$ в секундах дуги и примечания, объяснения к которым приведены после таблицы. Таб. 3 содержит информацию о точности измерений 247 положений. В ней дано количество положений, принадлежащих соответствующим интервалам по величине пределов $\Delta \alpha \cos \delta$ и $\Delta \delta$ двух независимых определений экваториальных координат. Из таблицы видно, что более чем половина положений имеет разницы в обоих координатах меньше, чем 0".5 а больше чем 90 % положений имеет разницы $\leq 1".0$. Эти данные характеризуют точность измерений опорных звёзд. Точность положения комет с ядром или с чётко выраженной центральной конденсацией, как правило, не должна превышать 1" по обоим координатам при наблюдениях на 60 см рефлекторе и 2" при наблюдениях 30 см астрографе. У слабых комет без ядра или центральной конденсации, ожидаемая ошибка может быть в два раза выше. Оправдываемость этого предположения следует из сравнений достаточно больших серий положений с точными эфемеридами. В таб. 4 приведен список наблюдавшихся комет и число полученных положений. В таб. 5 дан список сотрудников и указание об их участии в наблюдениях, измерениях и вычислениях.