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COMMUNICATIONS FROM THE OBSERVATORY AT LEIDEN

Determination of 256 positions of 14 minor planets in 1938, by *G. van Herk.*

This note gives the results of the observations made in 1938 of some minor planets of Professor BROUWER's programme[1]).

Instrumental equipment.

The telescope used is the 33 cm refractor of English mounting with a focal length of 520 cm (1 mm = 40″) and a useful field of about 2·5 square degrees. The plates which were used are of different brands and sizes; full particulars are given in the explanatory list of Table 2. We are using now only Guilleminot La Superguil 16 × 16 cm plates as they combine a high sensitivity with comparatively thick glass plates (2 mm). The glass of the Eastman 40 plates used is only 1·2 mm thick. No large deformations of the thick Guilleminot plates are to be expected. We had at our disposal for placing in front of the objective four different coarse gratings denoted by 1—4, with the following differences between central image and first order diffraction image: $0^m{\cdot}98$, $2^m{\cdot}13$, $3^m{\cdot}16$ and $4^m{\cdot}16$ respectively. They have been used with the bars parallel to the hour circle.

Measuring engine.

All plates were measured with glass in front by Mr. PELS with the measuring engine constructed in our workshop as a copy of the one designed by F. SCHLESINGER [2]). A few plates were measured with the Toepfer engine of the Danish Carlsberg Foundation; a description of such an instrument is given by E. J. MEYER [3]). Thirteen plates were measured both with glass and film in front by VAN HERK with the first mentioned engine, the screw of which showed a periodic error which was not quite constant over the whole range used. We have eliminated part of this error by setting on each image with two vertical lines separated by nearly one half of a revolution. The ocular end carries therefore a glass plate with two fine, etched lines, which was made for us at the Kamerlingh Onnes Physical Laboratory by the courtesy of Dr. C. A. CROMMELIN. The progressive screw errors were determined twice by Mr. PELS and once by VAN HERK; the differences between these determinations, which were made at intervals of about one year, are small. The adopted corrections are given in the accompanying Table 1.

TABLE 1.

screw reading	correction	screw reading	correction	screw reading	correction
mm	mm	mm	mm	mm	mm
10	— 0·0044	75	+ 0·0034	140	+ 0·0075
15	— 47	80	+ 41	145	+ 67
20	— 50	85	+ 47	150	+ 63
25	— 54	90	+ 56	155	+ 54
30	— 54	95	+ 64	160	+ 47
35	— 49	100	+ 70	165	+ 32
40	— 44	105	+ 75	170	+ 17
45	— 38	110	+ 75	175	00
50	— 30	115	+ 76	180	+ 22
55	— 15	120	+ 78	185	+ 36
60	00	125	+ 80	190	+ 59
65	+ 11	130	+ 79	195	+ 82
70	+ 22	135	+ 76	200	+ 106

Humidity effect.

At first we took a new plate for each exposure in order to diminish the influence of plate errors but at the request of Professor BROUWER this procedure was abandoned and two or more exposures were secured on one plate during the same night. In this way it is possible to detect the possible existence of a humidity effect. We are indebted to Professor BROUWER for his kind advice in this and other matters. The writer had the opportunity to discuss the humidity effect with Dr. A. WACHMANN of Bergedorf, who suggested the possibility of a systematic difference between the positions observed on damp nights on specially dried plates and on plates where no such precautions are

1) *Astr. Journ.* **44**, 57, 1935.
2) *Publ. Allegheny Obs.* **3**, 83, 1914.
3) *Ztschr. f. Instr.* **54**, 220, 1934.

taken. We are following this suggestion but have not yet sufficient material to come to any conclusion.

Tilt influence.

Our first intention was to reduce the measures with a projective method in order to be free from the tilt of the plate but the advantages of the dependence method [1]) are so obvious that we have used this method throughout the work. Now the tilt of the plate plays a role. The tilt has not been determined since about 35 years, when it was investigated by Dr. J. H. WILTERDINK [2]). We tried to keep the tilt under steady control by regularly securing plates with more than one exposure while the instrument was reversed in between. The differences found are discussed below together with the mean errors of the results.

Magnitudes.

We have tried to get some information concerning the magnitudes of the planets, though we did not aim at a rigorous solution of the problem. So we neglected the fact that, theoretically, always a small trail is formed by the planet. A photographic wedge was made [3]) by exposing a plate with this same instrument on a suitable field of stars with exposure times forming a geometrical progression. The wedge was calibrated with the Schilt photometer by Mr. DE KORT and was put film to film to our plates, to compare the images of the planet with those of the wedge. The scale and the zero point were taken from the stars of the *Henry Draper Catalogue*. It was not always possible to give an estimate of the magnitude of the planet so, for instance, when no sufficient H.D.C. stars were available or when the image of the planet differed too much from those of the stars. Furthermore we did not think it necessary to estimate always all exposures on the same plate. Of the 135 estimates given of the planets 27 were made by Mr. DE KORT, the remainder by VAN HERK. In the case of a reference star not entered in the H.D.C. we have estimated its magnitude together with that of the planet. The mean error of a given magnitude was computed to be $\pm$ 0^m·14 from the differences between the exposures on the same plate, estimated by VAN HERK. In the reduction of the plates sometimes the mean of the measures on the central image and on the first order spectra has been used, in order to equalize the mean magnitude of the stars as much as possible to that of the planet.

Differential refraction.

We did not succeed in giving a simple relation between the dependences as they are computed from the actual measurements and as they would have been if no refraction affected the positions. The differential refraction was put by Mr. DE KORT in the following form: $D_i c z_i^2$. Here the D_i are the dependences, the z_i are the vertical distances, in mm on the plate, of the stars to the almucantar passing through the planet and c is the coefficient of the second power term in the refraction expressed in mm on the plate as unit, which was compiled from Albrecht's tables. No differential aberration terms have been applied.

Comparison stars.

All positions of the comparison stars were taken from the Astronomische Gesellschaft Catalogues and were reduced to 1950·0 without proper motions.

Discussion of internal mean errors.

We computed the mean error of a setting in different ways, the results of which are given below, separated for central images and first order diffraction images in both the α and δ coordinates. From repeated settings on the images of the planets the results given in the first two lines of the table were found. The many differences between the settings on the two vertical lines yield the values given in the third and fourth line. (The numbers between parentheses denote the number of settings.)

	central images		first-order images	
	α coord.	δ coord.	α coord.	δ coord.
	μ	μ	μ	μ
PELS	$\pm$ 3·2	$\pm$ 3·0 (974)	$\pm$ 3·5	$\pm$ 3·0 (74)
v. HERK	$\pm$ 2·5	$\pm$ 2·5 (88)	$\pm$ 2·4	$\pm$ 1·9 (142)
PELS	$\pm$ 2·9	$\pm$ 2·6 (1062)	$\pm$ 3·5	$\pm$ 2·6 (750)
v. HERK	$\pm$ 2·2	$\pm$ 2·2 (288)	$\pm$ 2·5	$\pm$ 1·9 (238)

There did not exist a systematic difference between the measures of VAN HERK with glass and film in front and these differences define therefore a mean error of the position of the planet, independent of the errors of the reference stars. The same holds for the differences between the measures of Mr. PELS and VAN HERK.

These mean errors are respectively $\pm$ 0^s·004 in α, $\pm$ 0″·08 in δ and $\pm$ 0^s·006 in α and $\pm$ 0″·06 in δ.

We compared the motions of the planets computed from the ephemerides with the values derived from the observations. The maximum inaccuracy in the first mentioned motions, which is due to rounding off, is per minute: 0^s·002 in α and 0″·02 in δ.

1) See e.g. *J.B.A.A.* **39**, 203, 1929.
2) *Versl. v. d. Sterrew. te Leiden*, 1902—1904, 13.
3) See H. v. ZEIPEL und J. LINDGREN, *K. Sv. Vet. Handl.* Bd. **61**, No. 15, 1921.

In those cases where the instrument was not reversed we could form 86 comparisons which yielded a mean difference of $0^s.014$ in α and $0''.20$ in δ. The mean differences became $0^s.021$ in α and $0''.26$ in δ in the 32 cases where the instrument had been reversed between the observations.

The latter values are somewhat larger than the former, which may be explained by the error of tilt, the errors of the plate (lack of flatness) and the greater influence of the inaccuracy of the computed motions. We measured on five plates where the instrument had been reversed (10 exposures in either position) the position of a star with reference to three others. The mean of the differences without sign including one plate with very bad images became now $0^s.012$ in α and $0''.15$ in δ.

We believe therefore that the effect of the tilt has been sufficiently small.

I wish to express my thanks to Mr. DE KORT for his help on many occasions.

The greatest part of the computations has been carried out by Mr. G. PELS.

TABLE 2.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Remarks
		(1)	s	h m s		° ′ ″						
4576	dK	Sep 24·10879	60	3 52 23·405	8.883_n	+ 11 2 8·34	0·762	1	9·0	3	1	E; *1 : 10·0; *3 : 9·6
		24·11017	60	3 52 23·404	8.865_n	+ 11 2 8·27	0·762	1		3	1	
		24·11866	60	3 52 23·424	8.732_n	+ 11 2 7·96	0·761	1		3	2	
4582	dK	Oct 20·98788	50	3 44 13·521	9.222_n	+ 10 36 1·86	0·772	2	8·1		1	G; *2 : 10·1
		20·98857	50	3 44 13·492	9.218_n	+ 10 36 1·77	0·772	2			1	
4591	dK	22·97746	30	3 42 54·075	9.243_n	+ 10 33 29·16	0·773	3	8·2		1	G;
		22·97816	30	3 42 54·038	9.239_n	+ 10 33 29·01	0·773	3			1	
4603	vH	25·96591	46	3 40 46·248	9.252_n	+ 10 29 46·69	0·774	4			1	E;
		25·96746	45	3 40 46·166	9.244_n	+ 10 29 46·59	0·774	4			1	
		25·97423	47	3 40 45·857	9.208_n	+ 10 29 45·82	0·772	4	8·1		2	*3 : 11·0
		25·97561	47	3 40 45·800	9.200_n	+ 10 29 45·46	0·772	4	8·1		2	*3 : 11·1
4624	dK	Dec 14·01670	60	2 58 46·984	9·436	+ 10 34 8·13	0·788	5			1	G;
		14·01776	65	2 58 46·923	9·438	+ 10 34 8·20	0·788	5			1	
		14·02899	60	2 58 46·533	9·464	+ 10 34 9·62	0·792	5	8·4		1	*2 : 9·1
4625	vH	16·89398	45	2 57 11·501	8·653	+ 10 41 9·90	0·764	6			1	G;
		16·89571	45	2 57 11·456	8·690	+ 10 41 10·64	0·764	6			1	
		16·89892	60	2 57 11·348	8·750	+ 10 41 11·06	0·773	6			1	
		16·90653	60	2 57 10·939	8·867	+ 10 41 4·02	0·765	7			2	unsteady
		16·90792	60	2 57 10·873	8·885	+ 10 41 4·25	0·765	7	8·5		2	
		(2)										
4509	dK	Jul 14·08698	300	23 40 25·819	9.231_n	+ 8 2 34·55	0·791	8	12·2	1	1	G;
4514	vH	23·04240	300	23 41 27·586	9.323_n	+ 7 30 37·30	0·798	9	10·0	3	1	G; *2 : 9·0; u; damp
		23·04656	300	23 41 27·563	9.307_n	+ 7 30 36·23	0·798	9	10·4	3	1	*2 : 9·0
4517	dK	Aug 22·95068	210	23 31 33·002	9.321_n	+ 3 31 1·07	0·822	10		1	1	G; *images bad*
		22·95381	150	23 31 32·879	9.309_n	+ 3 30 58·87	0·822	10	9·4	1	1	
4521	vH	23·93203	270	23 30 57·816	9.375_n	+ 3 20 1·44	0·824	11	9·6	3	2	G;
		23·94208	270	23 30 57·448	9.341_n	+ 3 19 54·94	0·824	11		3	1	
		23·94622	270	23 30 57·290	9.326_n	+ 3 19 52·16	0·823	11	9·6	3	1	
4549	dK	Sep 11·00965	30	23 18 21·796	8·694	— 0 27 38·30	0·843	12			1	G;
		11·01103	30	23 18 21·745	8·721	— 0 27 39·68	0·843	12	9·3		1	*1 : 10·9; *2 : 10·6
		11·01917	30	23 18 21·351	8·850	— 0 27 45·99	0·843	12			2	
4562	vH	17·88845	60	23 13 9·816	9.224_n	— 2 2 27·69	0·851	13	9·1		1	G;
		17·89019	60	23 13 9·751	9.215_n	— 2 2 29·16	0·851	13			1	
		17·89781	60	23 13 9·381	9.172_n	— 2 2 35·56	0·851	13			2	
		17·89953	60	23 13 9·304	9.161_n	— 2 2 36·91	0·851	13			2	
		17·90196	59	23 13 9·198	9.146_n	— 2 2 38·91	0·851	13	9·1		2	
4570	dK	23·92440	150	23 8 42·829	8.683_n	— 3 25 41·81	0·859	14	9·2		1	E;
		23·92648	150	23 8 42·749	8.638_n	— 3 25 43·72	0·859	14			1	
		23·93860	90	23 8 42·210	8.204_n	— 3 25 53·93	0·859	14			2	
		23·93998	90	23 8 42·163	8.108_n	— 3 25 54·85	0·859	14	9·3		2	
4578	dK	26·92947	60	23 6 35·692	8.170_n	— 4 6 31·12	0·863	15	9·4		1	E;
		26·93051	60	23 6 35·659	8.094_n	— 4 6 31·67	0·863	15			1	
4579	dK	Oct 14·81281	240	22 56 27·043	9.174_n	— 7 47 59·49	0·877	16	9·9	1	1	G;
		14·81628	240	22 56 26·983	9.152_n	— 7 48 1·96	0·877	16		1	1	
		14·98456	240	22 56 22·662	9·349	— 7 49 52·25	0·872	16		1	2	
4589	dK	22·86891	60	22 53 44·533	8·470	— 9 9 56·49	0·886	17	9·8		1	G; *1 : 10·5
		22·86997	60	22 53 44·496	8·505	— 9 9 56·87	0·886	17			1	
4614	vH	Nov 11·81817	300	22 53 8·606	8·598	— 11 34 46·84	0·899	18	10·3	3	1	G; damp
		11·82267	300	22 53 8·651	8·699	— 11 34 48·16	0·899	18	10·1	3	1	
4626	dK	Dec 17·72514	301	23 12 18·362	8·322	— 12 45 48·05	0·900	19		2	1	G; "dried" plate
		17·72894	301	23 12 18·521	8·478	— 12 45 47·88	0·900	19	10·6	2	1	
4627	dK	17·73506	300	23 12 18·808	8·646	— 12 45 47·66	0·900	19	10·6	2	1	G;
		17·73864	300	23 12 18·995	8·720	— 12 45 47·39	0·899	19		2	1	

TABLE 2 *(continued)*.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Remarks
			s	h m s		° ′ ″						
4628	vH	Dec 17·74389	300	23 12 19·260	8·810	— 12 45 47·05	0·899	19		2	1	G;
		17·74747	300	23 12 19·442	8·862	— 12 45 46·95	0·899	19		2	1	
4629	vH	17·75295	300	23 12 19·696	8·931	— 12 45 46·69	0·898	19		2	1	G; "dried" plate
		17·75658	300	23 12 19·887	8·971	— 12 45 46·35	0·898	19		2	1	
		(3)										
4443	vH	Apr 30·05359	420	16 54 22·097	$8·888_n$	— 5 39 9·06	0·869	20	11·1	3	1	E; *2 : 10·9; *3 : 10·6
		30·06052	420	16 54 21·878	$8·791_n$	— 5 39 6·83	0·870	20	11·2	3	1	*2 : 10·9; *3 : 10·8
4461	vH	May 12·02704	360	16 46 55·501	$8·714_n$	— 4 41 45·55	0·865	21	10·9	2	1	E;
		12·03258	360	16 46 55·257	$8·594_n$	— 4 41 43·98	0·865	21	11·2	2	1	
4468	vH	24·95344	240	16 36 50·740	$9·081_n$	— 3 51 39·64	0·860	22	10·6	2	1	E; *1 : 10·2; u
		24·95794	240	16 36 50·490	$9·044_n$	— 3 51 38·78	0·860	22	10·7	2	1	*1 : 10·3
4484	vH	Jun 12·97046	240	16 21 2·831	8·769	— 3 12 31·06	0·858	23	11·7	3	2	G; *1 : 10·7; 1 mm
		12·97876	240	16 21 2·430	8·888	— 3 12 30·23	0·857	23		3	1	out of focus
4487	dK	18·00043	300	16 17 12·574	9·201	— 3 10 19·76	0·856	24	10·9	3	1	G;
		18·01567	300	16 17 11·861	9·277	— 3 10 19·58	0·855	24	11·1	3	2	
4490	vH	20·92924	180	16 15 6·261	8·386	— 3 10 34·49	0·858	25	11·3	3	2	G; *2 : 11·0
		20·93719	180	16 15 5·915	8·626	— 3 10 34·39	0·857	25		3	1	
4497	dK	Jul 1·97051	240	16 8 19·134	9·273	— 3 22 8·64	0·856	26	10·8	1	1	G;
		1·97397	240	16 8 19·022	9·289	— 3 22 9·04	0·856	26		1	1	
4500	vH	8·92178	150	16 5 8·313	9·120	— 3 37 10·20	0·858	27	11·2	3	1	G;
		8·92456	150	16 5 8·237	9·139	— 3 37 10·52	0·858	27		3	1	
4518	vH	Aug 23·84355	240	16 8 9·928	9·347	— 6 54 37·66	0·868	28		3	1	G; unsteady
		23·84771	240	16 8 10·035	9·361	— 6 54 39·63	0·867	28		3	1	
		(4)										
4421	vH	Apr 18·04845	90	16 23 44·428	$9·064_n$	— 11 41 33·75	0·893	29	7·0	3	1	E;
		18·05053	90	16 23 44·397	$9·047_n$	— 11 41 33·47	0·893	29		3	1	
4422	vH	18·05538	90	16 23 44·314	$9·002_n$	— 11 41 32·99	0·894	29		3	1	E;
		18·05711	90	16 23 44·289	$8·985_n$	— 11 41 32·89	0·894	29		3	1	clouds
4442	vH	30·03351	180	16 18 18·475	$8·828_n$	— 11 21 31·61	0·894	30		3	1	g;
		30·03698	180	16 18 18·332	$8·774_n$	— 11 21 31·53	0·894	30	6·4	3	1	*1 : 10·8; *2 : 11·8
4460	vH	May 12·00990	150	16 8 53·348	$8·496_n$	— 11 7 11·33	0·893	31,32	5·8	3	1	E; *2 : 9·9
		12·01232	150	16 8 53·216	$8·411_n$	— 11 7 11·14	0·894	31,32	5·8	3	1	*2 : 10·1
4469	vH	24·97231	90	15 56 14·424	$8·202_n$	— 11 4 49·37	0·893	33	5·9	4	1	E;
		24·97404	90	15 56 14·323	$8·077_n$	— 11 4 49·67	0·894	33		4	1	
		24·97578	90	15 56 14·224	$7·899_n$	— 11 4 49·37	0·894	33		4	1	
4475	dK	Jun 7·96437	119	15 43 4·129	8·874	— 11 24 15·52	0·894	34	6·8	3	1	I;
4482	vH	12·90969	90	15 39 13·408	$8·132_n$	— 11 37 16·47	0·896	35	6·0	4	1	I; clouds
		12·91349	90	15 39 13·268	$7·677_n$	— 11 37 16·57	0·896	35		4	1	
		12·92112	90	15 39 12·898	8·113	— 11 37 18·65	0·896	35		4	2	
		12·92354	90	15 39 12·745	8·269	— 11 37 18·80	0·896	35		4	2	
4489	vH	20·90048	90	15 34 20·498	8·373	— 12 5 0·91	0·897	36	6·6	3	1	I; *1 : 9·4; *stars faint*
		20·90238	90	15 34 20·470	8·448	— 12 5 1·45	0·897	36		3	1	unsteady
		20·91104	90	15 34 20·185	8·682	— 12 5 3·52	0·897	36		3	2	
		20·91416	90	15 34 20·062	8·742	— 12 5 4·45	0·896	36	6·6	3	2	*1: 9·5
4499	vH	Jul 8·90759	30	15 30 34·120	9·194	— 13 34 33·49	0·896	37	7·2	3	1	G; *2: 11·1; *stars faint*
		8·90863	30	15 30 34·101	9·200	— 13 34 34·04	0·896	37		3	1	damp; u!
		8·91001	30	15 30 34·114	9·208	— 13 34 34·45	0·896	37		3	1	
		(6)										
4471	vH	May 25·06927	180	20 56 31·208	$9·391_n$	— 7 21 59·59	0·868	38	10·2	3	1	G; trees
		25·07205	180	20 56 31·336	$9·382_n$	— 7 21 59·26	0·868	38		3	1	
4488	dK	Jun 18·04270	300	21 7 9·733	$9·275_n$	— 7 21 19·13	0·872	39		3	1	G;
		18·04927	300	21 7 9·796	$9·243_n$	— 7 21 20·44	0·873	39		3	1	
		18·06730	300	21 7 9·943	$9·140_n$	— 7 21 22·28	0·875	39		3	2	
		18·07350	300	21 7 10·020	$9·096_n$	— 7 21 23·80	0·876	39		3	2	
4504	vH	Jul 9·01884	47	21 4 13·978	$9·060_n$	— 9 5 14·91	0·883	40	9·4		1	G; *2 : 11·6
		9·02074	47	21 4 13·924	$9·044_n$	— 9 5 15·80	0·884	40			1	
		9·02784	47	21 4 13·734	$8·978_n$	— 9 5 19·56	0·884	40			2	
		9·02959	47	21 4 13·683	$8·960_n$	— 9 5 20·04	0·884	40	9·5		2	*2 : 11·5
4508	dK	14·06655	60	21 1 44·844	8·452	— 9 47 18·88	0·889	41	9·4		1	G;
		14·06759	60	21 1 44·800	8·487	— 9 47 19·59	0·888	41			1	
4516	vH	23·07426	60	20 55 51·109	9·045	— 11 19 5·53	0·892	42,43	8·9		1	G; *1 : 11·2
		23·07566	60	20 55 51·045	9·057	— 11 19 6·52	0·892	42,43			1	
4524	vH	Aug 24·91606	77	20 29 30·548	$7·446_n$	— 18 14 11·66	0·917	44	9·2		1	G;
		24·91780	77	20 29 30·479	7·130	— 18 14 12·86	0·917	44			1	
		24·91953	77	20 29 30·413	7·740	— 18 14 14·00	0·917	44			1	
4536	dK	31·88360	40	20 25 51·248	$8·460_n$	— 19 34 25·36	0·920	45			2	G; *uncertain*
		31·88428	40	20 25 51·208	$8·435_n$	— 19 34 26·45	0·920	45			2	
		31·88498	40	20 25 51·195	$8·408_n$	— 19 34 26·67	0·920	45	8·9		2	*2 : 9·5

TABLE 2 *(continued)*.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Remarks
			s	h m s		° ′ ″						
4544	dK	Sep 10·86179	30	20 23 17·845	8·060$_n$	— 21 12 52·51	0·925	46	9·1		2	G;
		10·86248	30	20 23 17·821	7·991$_n$	— 21 12 53·77	0·925	46			2	
		10·87168	30	20 23 17·754	8·100	— 21 12 58·02	0·925	46			1	
4622	vH	Dec 6·70634	240	22 3 41·541	8·280	— 20 52 57·39	0·924	47	10·1	3	2	G;
		6·70979	240	22 3 41·917	8·438	— 20 52 56·56	0·924	47		3	2	damp!
		6·71360	300	22 3 42·374	8·564	— 20 52 54·69	0·924	47		3	2	
		(7)										
4419	vH	Apr 17·95929	360	13 3 30·310	7·495$_n$	— 14 26 50·95	0·906	48	10·1	2	1	g; unsteady
		17·96482	360	13 3 29·986	7·995	— 14 26 48·60	0·905	48		2	1	
4420	vH	17·97383	360	13 3 29·521	8·491	— 14 26 45·21	0·905	48	10·1	2	1	g;
		17·97902	360	13 3 29·214	8·635	— 14 26 43·03	0·905	48		2	1	clouds
4439	vH	29·95525	360	12 53 38·492	8·899	— 13 5 11·75	0·899	49	10·5	3	1	g;
		29·95976	360	12 53 38·280	8·952	— 13 5 10·07	0·899	49		3	1	
4458	vH	May 11·95086	360	12 46 19·112	9·183	— 11 50 54·07	0·891	50	10·8	3	1	G; u; trees; *bad plate*
		11·95674	360	12 46 18·957	9·217	— 11 50 52·08	0·890	50	10·8	3	1	
4466	vH	24·89856	330	12 42 2·440	9·087	— 10 48 46·34	0·889	51	11·3	3	1	G; unsteady
		24·90445	330	12 42 2·376	9·130	— 10 48 44·87	0·888	51	11·3	3	1	trees
		(12)										
4225	vH	Feb 6·00929	478	10 5 16·704	8·720$_n$	— 1 49 21·29	0·850	52	13·3	4	1	E; *1 : 9·1; *3 : 10·6; h; *faint!*
4226	vH	6·01778	482	10 5 17·144	8·480$_n$	— 1 49 22·81	0·850	52	12·5	4	1	E; *3 : 10·7; h; *bad plate!*
4278	vH	23·95573	480	9 48 7·615	8·511$_n$	— 0 26 16·44	0·842	53		4	1	E; u
4279	vH	23·96560	510	9 48 7·059	8·002$_n$	— 0 26 13·55	0·842	53		4	1	E;
4300	vH	Mar 1·97947	480	9 42 29·332	8·827	+ 0 10 27·21	0·839	54	11·5	4	1	E; *3 : 10·7
4301	vH	1·98847	480	9 42 28·777	8·940	+ 0 10 31·64	0·839	54	12·2	4	1	E; *3 : 10·5
4309	vH	3·94225	480	9 40 44·164	7·269$_n$	+ 0 22 52·20	0·837	55	13·1	4	1	E; u; *p. faint! bad p.!*
4310	vH	3·96234	480	9 40 43·163	8·640	+ 0 22 59·27	0·837	55		4	1	E; u; *bad plate*
4355	vH	18·86325	480	9 29 37·322	8·846$_n$	+ 1 59 46·43	0·828	56	11·5	4	1	E; ended in clouds
4369	vH	20·97101	480	9 28 26·261	9·255	+ 2 13 2·99	0·828	57	11·2	4	1	E; *planet faint*
4370	vH	20·98036	480	9 28 25·987	9·297	+ 2 13 5·59	0·828	57		4	1	E;
4373	vH	21·89936	480	9 27 57·192	8·511	+ 2 18 48·08	0·825	57	12·0	4	1	E; hazy
4374	vH	21·90906	480	9 27 56·861	8·735	+ 2 18 51·33	0·825	57		4	1	E; hazy
4399	vH	Apr 12·91025	480	9 23 4·330	9·282	+ 4 12 53·14	0·817	58	12·5	4	1	g; hazy
		12·91787	480	9 23 4·329	9·314	+ 4 12 54·25	0·817	58		4	1	
4450	vH	May 6·88696	420	9 31 40·487	9·409	+ 5 10 6·15	0·816	59		4	1	G; u; *p. faint; bad p.!*
		(25)										
4396	vH	Apr 12·84108	490	9 53 15·083	7·526$_n$	— 9 44 37·65	0·888	60		4	1	g; hazy; *planet faint!*
		12·84827	480	9 53 15·061	8·121	— 9 44 33·71	0·888	60	12·6	4	1	
4437	vH	29·88324	483	9 55 8·746	9·272	— 6 47 41·83	0·870	61		4	1	g; *stars at the edges*
		29·89050	480	9 55 8·888	9·306	— 6 47 37·23	0·869	61	13·5	4	1	*of the plate*
4449	vH	May 6·86445	480	9 57 57·983	9·263	— 5 48 33·54	0·867	62	13·2	4	1	G; *1 : 10·7; *p. faint*
		6·87207	480	9 57 58·236	9·297	— 5 48 29·42	0·865	62	13·5	4	1	*1 : 10·7; u; *bad plate!*
		(57)										
4552	dK	Sep 11·13690	300	4 38 6·969	9·213$_n$	+ 13 27 3·68	0·748	63		3	2	G; *very faint*
		11·14106	300	4 38 7·130	9·189$_n$	+ 13 27 2·46	0·747	63	12·9	3	2	*1 : 10·4; *3 : 10·4
		11·15560	240	4 38 7·796	9·090$_n$	+ 13 26 58·16	0·744	63		3	1	clouds
4577	dK	24·13736	330	4 45 54·075	8·982$_n$	+ 12 19 30·88	0·752	64		3	1	E;
		24·14151	330	4 45 54·188	8·938$_n$	+ 12 19 29·32	0·751	64	12·7	3	1	*1:9·1
4583	dK	Oct 21·07626	360	4 49 46·536	8·862$_n$	+ 9 15 29·78	0·776	65	12·3	3	1	G; *1 : 10·9; *3 : 10·0
		21·08109	360	4 49 46·485	8·791$_n$	+ 9 15 27·39	0·776	65	12·3	3	1	*1 : 10·9; *3 : 10·0
4592	dK	22·99703	420	4 49 22·248	9·352$_n$	+ 9 0 51·40	0·790	66	12·6	3	1	*images elongated*
		23·00259	420	4 49 22·153	9·332$_n$	+ 9 0 48·63	0·789	66		3	1	G; *1 : 11·2; *3 : 10·1
4604	vH	26·00547	300	4 48 33·176	9·284$_n$	+ 8 37 44·35	0·789	67		3	1	G;
		26·00997	300	4 48 33·077	9·263$_n$	+ 8 37 42·22	0·788	67		3	1	
		26·01897	300	4 48 32·921	9·218$_n$	+ 8 37 38·06	0·787	67	12·1	3	2	*1 : 10·9; *2 : 11·4;
		26·02348	300	4 48 32·816	9·193$_n$	+ 8 37 35·84	0·786	67		3	2	*3 : 11·1
		(185)										
4423	vH	Apr 18·07217	480	16 52 34·365	9·029$_n$	+ 8 57 54·02	0·780	68	13·2	3	1	g; *1 : 11·0; *1 : 11·9
		18·07864	460	16 52 34·291	8·966$_n$	+ 8 57 57·45	0·779	68		3	1	end in clouds
4424	vH	18·09710	480	16 52 33·993	8·707$_n$	+ 8 58 7·63	0·778	68		3	1	g; clouds
		18·10368	480	16 52 33·906	8·555$_n$	+ 8 58 11·10	0·777	68		3	1	hazy!
4441	vH	29·99992	480	16 48 16·616	9·266$_n$	+ 10 39 43·90	0·773	69		3	1	g;
		30·00754	480	16 48 16·415	9·228$_n$	+ 10 39 47·43	0·771	69	13·3	3	1	
4459	vH	May 11·97198	360	16 41 5·479	9·219$_n$	+ 12 4 3·62	0·760	70	12·8	3	1	G; *1 : 9·6; *3 : 10·1
		11·97753	361	16 41 5·252	9·187$_n$	+ 12 4 5·77	0·758	70	12·7	3	1	*1 : 9·6; *3 : 10·0
4467	vH	24·92037	450	16 31 5·552	9·267$_n$	+ 13 1 55·05	0·754	71	12·9	3	1	G; unsteady!
		24·92730	450	16 31 5·189	9·232$_n$	+ 13 1 56·08	0·752	71		3	1	

TABLE 2 *(continued)*.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Remarks
			s	h m s		° ′ ″						
4474	vH	Jun 7·94117	480	16 19 27·363	8·570$_n$	+ 13 15 21·50	0·742	72	12·5	3	1	G;*3:8·8
		7·95365	481	16 19 26·755	7·908$_n$	+ 13 15 20·69	0·741	72	12·7	3	2	*3:9·0
4483	vH	12·93686	420	16 15 31·696	7·957$_n$	+ 13 7 3·95	0·741	73	12·9	4	1	G;
		12·95419	420	16 15 30·904	8·496	+ 13 7 1·26	0·741	73	12·6	4	2	
4485	dK	16·94014	420	16 12 34·395	8·459	+ 12 55 40·39	0·743	74		3	1	G;
4491	vH	20·94896	360	16 9 49·401	8·896	+ 12 40 8·75	0·747	75	12·0	3	1	G;*1: 9·6;*2:10·4;u
		20·95831	360	16 9 49·027	8·999	+ 12 40 6·11	0·748	75		3	2	
4496	dK	25·04642	360	16 7 16·313	9·464	+ 12 20 21·17	0·781	76	13·1	3	1	G;*1:10·0;*2: 9·8;
4501	vH	Jul 8·94273	420	16 1 1·009	9·264	+ 10 47 3·36	0·772	77	13·5	4	1	G; *3:10·9
		8·95589	420	16 1 0·740	9·320	+ 10 46 57·01	0·775	77	13·5	4	2	
4519	vH	Aug 23·86502	420	16 9 58·418	9·408	+ 3 11 11·43	0·826	78		4	1	G;unsteady
		23·87229	420	16 9 58·732	9·426	+ 3 11 6·65	0·826	78	13·6	4	1	
4523	vH	24·85018	420	16 10 37·898	9·370	+ 3 0 44·79	0·825	79	13·2	4	1	G;
		24·85641	420	16 10 38·084	9·389	+ 3 0 41·33	0·826	79		4	1	
		(216)										
4515	vH	Jul 23·05868	300	23 56 54·703	9·314$_n$	+ 15 41 3·48	0·736	80	11·6	3	1	G;*1: 9·9;*3: 9·8
		23·06318	300	23 56 54·842	9·294$_n$	+ 15 41 5·25	0·734	80		3	1	
4520	vH	Aug 23·90277	180	0 2 41·742	9·512$_n$	+ 17 7 57·35	0·764	81	10·5	3	1	G; *3:10·7; *bad plate*
		23·91490	180	0 2 41·569	9·491$_n$	+ 17 7 56·27	0·756	81		3	2	
		23·91836	180	0 2 41·524	9·484$_n$	+ 17 7 55·96	0·754	81	10·5	3	2	*3: 9·9
4525	vH	24·93709	300	0 2 27·619	9·434$_n$	+ 17 6 11·50	0·742	82		3	1	G;
		24·94194	300	0 2 27·552	9·421$_n$	+ 17 6 11·00	0·739	82	10·5	3	1	*2: 9·7
		24·95094	300	0 2 27·415	9·394$_n$	+ 17 6 9·76	0·734	82		3	2	
4531	dK	26·90757	210	0 1 56·532	9·488$_n$	+ 17 1 51·27	0·756	83	10·7	1	1	G;
		26·91138	210	0 1 56·476	9·480$_n$	+ 17 1 50·60	0·754	83		1	1	*3: 9·9
		26·92316	210	0 1 56·229	9·454$_n$	+ 17 1 49·18	0·747	83		1	2	
		26·92627	210	0 1 56·159	9·447$_n$	+ 17 1 48·64	0·745	83		1	2	
4537	dK	31·91020	30	0 0 13·646	9·449$_n$	+ 16 45 5·00	0·748	84	10·5		1	G;*1:10·1;*2:10·5; *bad*
		31·91089	30	0 0 13·632	9·448$_n$	+ 16 45 4·67	0·747	84	10·6		1	*1:10·2;*2:10·4
		31·91955	30	0 0 13·432	9·425$_n$	+ 16 45 2·49	0·742	84			2	
4545	dK	Sep 10·89089	32	23 55 21·522	9·417$_n$	+ 15 46 34·81	0·749	85			1	G;
		10·89226	30	23 55 21·485	9·413$_n$	+ 15 46 34·33	0·748	85	11·1		1	*1:11·1;*3:10·5
		10·90680	30	23 55 20·981	9·368$_n$	+ 15 46 27·51	0·741	85			2	
4563	vH	17·91148	90	23 51 7·136	9·255$_n$	+ 14 46 10·36	0·739	86	10·1		2	G;*2:9·4
		17·91355	90	23 51 7·066	9·248$_n$	+ 14 46 9·16	0·739	86			2	
		17·92221	90	23 51 6·725	9·197$_n$	+ 14 46 4·29	0·736	86			1	
		17·92464	90	23 51 6·626	9·182$_n$	+ 14 46 2·78	0·735	86			1	
4575	dK	24·08445	40	23 47 9·150	9·382	+ 13 41 27·78	0·760	87		3	1	E;*stars at the edges of*
		24·08513	40	23 47 9·114	9·384	+ 13 41 27·30	0·760	87		3	1	*the plate*
4580	dK	Oct 15·00188	241	23 36 6·440	9·312	+ 9 18 30·17	0·786	88	10·5	1	1	G; *1:10·2; clouds
		15·00534	240	23 36 6·379	9·326	+ 9 18 27·53	0·787	88		1	1	
4581	dK	20·95764	90	23 34 32·695	9·179	+ 8 3 18·88	0·790	89	11·1		1	G;*2:12·1; *bad images*
		20·95902	90	23 34 32·673	9·187	+ 8 3 17·75	0·790	89			1	hazy
4590	dK	22·88264	40	23 34 14·703	7·532$_n$	+ 7 39 54·69	0·788	90	11·1		1	G;
		22·88334	40	23 34 14·678	7·260$_n$	+ 7 39 54·26	0·788	90	11·1		1	
4602	vH	25·94147	130	23 33 59·171	9·165	+ 7 3 57·77	0·797	91			1	E;unsteady
		25·94701	130	23 33 59·148	9·198	+ 7 3 54·18	0·797	91			1	
4615	vH	Nov 11·83652	300	23 37 34·965	8·029	+ 4 21 49·10	0·812	92	11·4	3	1	G;*1:10·7;*3:11·0
		11·84310	300	23 37 35·134	8·409	+ 4 21 46·08	0·812	92		3	1	
		(287)										
4218	vH	Feb 3·98019	480	7 21 36·064	9·120	+ 15 41 19·92	0·723	93	12·9	4	1	E;*3: 9·5;*p. faint*
4219	vH	3·98980	480	7 21 35·606	9·184	+ 15 41 24·66	0·726	93	12·9	4	1	E;*3: 9·8
4221	vH	5·95769	480	7 20 6·625	8·982	+ 15 55 25·94	0·717	94	13·5	4	1	E;*2: 9·3;*3:10·2;u!haz
4222	vH	5·96669	480	7 20 6·252	9·066	+ 15 55 29·48	0·719	94	13·6	4	1	E;*2: 9·6;*3:10·0;u!haz
4241	vH	16·92826	480	7 13 49·294	9·033	+ 17 9 47·44	0·706	95	13·0	4	1	E;*1: 9·2;hazy
4242	vH	16·93900	480	7 13 49·113	9·121	+ 17 9 51·60	0·708	95	13·0	4	1	E;*1: 8·8;hazy
4274	vH	23·90310	480	7 11 46·091	8·990	+ 17 52 35·16	0·697	96	13·0	4	1	E;*1: 9·6;*3:10·5
4275	vH	23·91280	480	7 11 45·966	9·079	+ 17 52 38·86	0·699	96	13·5	1	1	E;*1: 9·4;*3: 9·1;u!
4296	vH	Mar 1·92406	480	7 11 16·398	9·260	+ 18 26 2·72	0·704	97	11·9	4	1	E;*1: 9·7;*2:10·1
4297	vH	1·93341	480	7 11 16·379	9·303	+ 18 26 5·82	0·708	97	11·6	4	1	E;*2: 9·8
4316	vH	4·94195	480	7 11 28·208	9·369	+ 18 41 29·86	0·714	98	12·5	4	1	E;*1: 9·5; *planet faint*
4317	vH	4·95130	480	7 11 28·196	9·400	+ 18 41 32·60	0·720	98		4	1	E;
		(409)										
4223	vH	Feb 5·98123	480	8 50 9·820	7·698	— 0 15 14·68	0·841	99	13·4	4	1	E;*1:11·1;*3:10·3;u
4224	vH	5·99024	480	8 50 9·362	8·406	— 0 15 13·17	0·841	99	12·5	4	1	E;*1:10·8;*3:10·1;u
4276	vH	23·92630	480	8 34 53·738	8·201	+ 0 57 7·39	0·834	100	11·8	4	1	E;*1: 9·8;*2:10·5;u
4277	vH	23·93600	480	8 34 53·326	8·578	+ 0 57 10·06	0·834	100	11·5	4	1	E;*1:10·5;*2:10·6;u

TABLE 2 *(continued)*.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	Remarks
			s	h m s		° ′ ″						
4298	vH	Mar 1·94761	480	8 31 3·653	9·025	+ 1 28 0·48	0·831	101	12·3	4	1	E;*1: 9·5
4299	vH	1·95661	480	8 31 3·339	9·098	+ 1 28 3·33	0·831	101	12·8	4	1	E;*1: 10·2
4318	vH	4·96792	480	8 29 28·703	9·226	+ 1 43 57·20	0·830	102		4	1	E;end in fog
4353	vH	18·84005	480	8 25 26·777	$8·353_n$	+ 2 56 5·67	0·821	103	12·6	4	1	E;*3: 9·8
4354	vH	18·84853	510	8 25 26·678	$7·513_n$	+ 2 56 8·27	0·821	103		4	1	E;
4371	vH	21·87307	480	8 25 17·628	8·851	+ 3 10 51·46	0·820	104	12·7	4	1	E;hazy
4372	vH	21·88274	480	8 25 17·594	8·966	+ 3 10 54·39	0·820	104	12·8	4	1	E;hazy
4398	vH	Apr 12·89017	480	8 31 41·418	9·344	+ 4 35 0·41	0·816	105	12·7	4	1	g;hazy; *bad images*
		12·89744	480	8 31 41·635	9·369	+ 4 35 1·47	0·817	105		4	1	
		(532)										
4550	dK	Sep 11·04583	300	0 52 45·519	$8·246_n$	− 18 12 17·44	0·917	106		3	1	G;
		11·04964	300	0 52 45·213	$7·928_n$	− 18 12 19·73	0·917	106		3	1	
		11·06973	300	0 52 44·484	8·597	− 18 12 29·54	0·917	106		3	2	
4633	dK	Dec 19·82703	1232	0 15 40·790	9·221	− 16 56 21·37	0·905	107			1	G; *bad plate*
		19·84156	1170	0 15 41·163	9·294	− 16 56 15·61	0·901	107			1	

TABLE 3.

B.D.	α 1950·0	δ 1950·0	dependences
°	h m s	° ′ ″	
1 + 10·501	3 51 4·92	+ 10 21 12·4	·0578 ·0578 ·0576
+ 10·502	3 52 27·24	+ 11 9 31·1	·7985 ·7985 ·7982
+ 10·503	3 52 33·76	+ 10 37 36·3	·1437 ·1437 ·1442
2 + 10·479	3 43 22·45	+ 10 23 37·2	·3866 ·3868
+ 10·482	3 44 23·75	+ 10 46 2·4	·4315 ·4316
+ 10·487	3 45 37·89	+ 10 38 38·9	·1819 ·1817
3 + 10·474	3 41 51·23	+ 10 58 52·5	+·3020 +·3023
+ 10·479	3 43 22·45	+ 10 23 37·2	+·7185 +·7185
+ 10·481	3 44 4·39	+ 11 1 55·2	−·0205 −·0208
4 + 9·472	3 38 49·01	+ 9 55 23·9	·3956 ·3958 ·3970 ·3972
+ 10·474	3 41 51·23	+ 10 58 52·5	·4599 ·4602 ·4611 ·4612
+ 10·477	3 42 41·26	+ 10 31 11·3	·1445 ·1439 ·1419 ·1416
5 + 10·401	2 58 0·86	+ 10 40 26·8	·3789 ·3796 ·3841
+ 9·387	2 58 6·98	+ 10 2 50·7	·2522 ·2520 ·2507
+ 10·404	3 0 1·81	+ 10 49 1·8	·3689 ·3684 ·3652
6 + 9·382	2 55 41·94	+ 10 0 19·4	·3900 ·3904 ·3912
+ 10·401	2 58 0·86	+ 10 40 26·8	·2801 ·2792 ·2774
+ 11·421	2 58 15·87	+ 11 30 1·4	·3299 ·3305 ·3313
7 + 9·382	2 55 41·94	+ 10 0 19·4	+·6886 +·6888
+ 10·406	3 0 38·21	+ 11 15 36·0	+·6942 +·6945
+ 10·408	3 0 45·51	+ 10 30 28·8	−·3829 −·3833
8 + 7·5078	23 39 8·42	+ 7 55 35·6	·5368
+ 7·5080	23 41 45·78	+ 8 13 38·4	·3789
+ 7·5082	23 42 39·70	+ 7 57 12·1	·0843
9 + 6·5183	23 39 23·93	+ 6 58 27·7	·1538 ·1535
+ 6·5190	23 41 2·62	+ 7 16 34·8	·4320 ·4330
+ 7·5082	23 42 39·70	+ 7 57 12·1	·4141 ·4136
10 + 2·4680	23 30 21·28	+ 3 6 19·1	·4313 ·4322
+ 3·4872	23 31 29·82	+ 3 55 51·8	·2171 ·2169
+ 3·4878	23 33 3·03	+ 3 45 58·3	·3516 ·3509
11 + 2·4680	23 30 21·28	+ 3 6 19·2	·0666 ·0750 ·0786
+ 3·4868	23 30 31·34	+ 3 32 14·3	·6079 ·6029 ·6007
+ 2·4684	23 31 54·71	+ 3 0 1·0	·3255 ·3221 ·3206
12 − 1·4417	23 17 18·38	− 0 43 56·4	+·7613 +·7613 +·7627
− 1·4421	23 19 53·89	− 0 31 17·6	−·1726 −·1720 −·1706
− 0·4509	23 20 57·79	+ 0 0 59·9	+·4114 +·4107 +·4079

TABLE 3 *(continued)*.

B.D.	α 1950·0	δ 1950·0	dependences
°	h m s	° ′ ″	
13 — 2·5913	23 12 7·67	— 2 20 49·4	·3538 ·3546 ·3584 ·3592 ·3603
— 2·5914	23 13 24·09	— 1 41 48·3	·3644 ·3639 ·3618 ·3614 ·3607
— 2·5918	23 14 9·39	— 2 6 7·1	·2817 ·2815 ·2798 ·2794 ·2790
14 — 3·5575	23 6 27·93	— 2 49 20·8	·0598 ·0599 ·0608 ·0609
— 4·5837	23 8 13·89	— 3 47 8·6	·2143 ·2157 ·2238 ·2246
— 3·5584	23 9 2·50	— 3 22 21·5	·7258 ·7244 ·7153 ·7145
15 — 4·5822	23 4 6·15	— 4 28 14·2	·2794 ·2794
— 4·5830	23 6 40·26	— 4 12 35·7	·3099 ·3103
— 4·5837	23 8 13·89	— 3 47 8·6	·4107 ·4103
16 — 8·5989	22 55 53·58	— 8 0 5·4	+1·0344 +1·0305 +·9732
— 8·5996	22 57 5·15	— 7 39 46·3	— ·6920 — ·6820 —·4702
— 7·5906	22 57 59·67	— 7 20 17·8	+ ·6576 + ·6514 +·4971
17 — 10·6016	22 52 18·44	— 9 38 28·5	+ ·5306 + ·5308
— 9·6093	22 55 59·59	— 8 43 19·6	+ ·8809 + ·8809
— 9·6097	22 56 42·94	— 8 49 47·4	— ·4116 — ·4117
18 — 12·6371	22 50 50·84	—11 52 58·1	·4044 ·4049
— 11·5952	22 53 27·97	—11 19 55·1	·2333 ·2317
— 11·5961	22 55 29·62	—11 23 58·8	·3623 ·3634
19 — 13·6365	23 10 12·43	—12 52 8·8	·5232 ·5227 ·5216 ·5209 ·5200 ·5193 ·5184 ·5177
— 12·6457	23 14 6·60	—12 14 31·0	·2435 ·2437 ·2440 ·2442 ·2446 ·2448 ·2451 ·2454
— 13·6377	23 15 7·69	—13 4 4·1	·2333 ·2337 ·2344 ·2348 ·2355 ·2359 ·2365 ·2369
20 — 5·4375	16 52 2·97	— 5 37 50·2	·2137 ·2131
— 5·4383	16 54 32·42	— 5 36 19·4	·6083 ·6115
— 5·4389	16 56 33·95	— 5 50 21·4	·1780 ·1754
21 — 4·4165	16 46 12·74	— 4 25 36·3	·2056 ·2079
— 4·4168	16 46 19·38	— 4 53 53·1	·6006 ·5995
— 4·4183	16 49 32·71	— 4 21 17·8	·1938 ·1926
22 — 3·3973	16 35 18·70	— 3 36 34·0	+ ·5822 + ·5839
— 3·3974	16 37 4·91	— 3 31 22·0	— ·0630 — ·0641
— 3·3978	16 38 44·10	— 4 7 15·7	+ ·4808 + ·4802
23 — 3·3937	16 22 11·90	— 3 20 14·4	·4027 ·3999
— 2·4176	16 21 13·45	— 3 51 30·9	·2908 ·2915
— 3·3926	16 19 22·01	— 3 22 17·6	·3065 ·3086
24 — 2·4160	16 17 22·09	— 2 54 21·2	+ ·7703 + ·7734
— 3·3920	16 17 28·40	— 3 51 35·4	+ ·3262 + ·3292
— 3·3926	16 19 22·01	— 3 22 17·6	— ·0965 — ·1026
25 — 2·4144	16 12 24·79	— 2 43 25·7	— ·0373 — ·0363
[— 3·3908]	16 14 6·11	— 3 15 26·6	+ ·7497 + ·7501
— 2·4160	16 17 22·09	— 2 54 21·2	+ ·2876 + ·2863
26 — 3·3882	16 6 59·25	— 2 24 57·3	·5298 ·5304
— 3·3888	16 8 36·57	— 3 51 38·7	·2302 ·2300
— 2·4130	16 10 58·68	— 2 47 36·5	·2400 ·2396
27 — 2·4108	16 3 46·29	— 3 11 38·0	·2961 ·2964
— 3·3876	16 4 30·01	— 4 9 46·2	·3605 ·3607
— 3·3882	16 6 59·25	— 3 24 57·3	·3434 ·3429
28 — 6·4373	16 7 10·35	— 6 48 44·7	·4307 ·4295
— 7·4222	16 8 31·05	— 7 19 4·0	·2919 ·2931
— 6·4377	16 9 20·22	— 6 38 1·6	·2773 ·2775
29 — 11·4132	16 22 17·32	—11 46 6·9	·1215 ·1217 ·1224 ·1226
— 11·4135	16 23 32·66	—11 22 26·9	·4321 ·4321 ·4321 ·4321
— 11·4140	16 24 19·56	—11 58 49·1	·4464 ·4462 ·4455 ·4453
30 — 11·4112	16 17 28·93	—11 50 5·4	·3312 ·3314
— 10·4297	16 18 3·00	—11 4 21·3	·4176 ·4186
— 10·4305	16 19 49·38	—11 12 23·3	·2512 ·2499

TABLE 3 *(continued)*.

B.D.	α 1950·0	δ 1950·0	dependences
	h m s	° ′ ″	
31 — 10·4258	16 7 5·71	—11 0 5·4	·0238 ·0248
— 10·4264	16 8 46·36	—11 8 5·1	·7855 ·7856
— 10·4267	16 9 35·69	—11 4 24·0	·1907 ·1897
32 — 11·4080	16 6 34·46	—11 25 16·1	·3180 ·3184
— 10·4266	16 9 14·35	—10 37 54·6	·4406 ·4406
— 11·4097	16 11 17·91	—11 36 43·5	·2414 ·2410
33 — 10·4214	15 55 4·32	—10 59 3·0	+·3507 +·3518 +·3527
— 10·4216	15 56 28·04	—10 48 9·7	—·0236 —·0243 —·0245
— 10·4217	15 56 51·45	—11 7 14·4	+·6729 +·6726 +·6718
34 — 10·4155	15 41 18·02	—11 4 55·0	+·7582
— 11·3998	15 41 30·50	—11 48 24·9	—·3208
— 11·4010	15 44 34·19	—12 4 4·0	+·5626
35 — 11·3989	15 38 24·99	—11 42 33·8	·5985 ·5994 ·6024 ·6033
— 10·4145	15 39 15·25	—11 8 42·8	·1926 ·1924 ·1911 ·1909
— 11·3998	15 41 30·50	—11 48 24·5	·2089 ·2082 ·2065 ·2058
36 — 11·3975	15 32 54·41	—12 12 26·2	·5080 ·5084 ·5104 ·5113
— 11·3977	15 33 44·20	—11 49 53·6	·1963 ·1960 ·1948 ·1943
— 11·3986	15 37 12·40	—12 2 13·6	·2957 ·2957 ·2948 ·2944
37 — 12·4272	15 29 28·38	—13 11 30·9	·3493 ·3492 ·3490
[— 13·4190]	15 30 14·32	—14 0 6·4	·3613 ·3616 ·3617
— 13·4200	15 32 18·24	—13 30 26·1	·2894 ·2892 ·2892
38 — 7·5459	20 55 56·64	— 7 24 25·4	·6441 ·6430
— 7·5460	20 56 26·97	— 7 6 4·6	·1952 ·1958
— 7·5472	20 58 55·02	— 7 31 34·0	·1606 ·1612
39 — 7·5501	21 6 5·28	— 7 11 23·5	·5854 ·5849 ·5839 ·5832
— 8·5597	21 8 6·80	— 7 50 44·2	·0581 ·0587 ·0592 ·0598
— 7·5507	21 8 46·37	— 7 32 48·5	·3565 ·3564 ·3570 ·3570
40 — 9·5652	21 3 14·11	— 9 2 9·9	·0417 ·0421 ·0430 ·0435
— 9·5654	21 3 35·45	— 9 25 55·4	·2355 ·2360 ·2382 ·2384
— 9·5658	21 4 29·97	— 8 58 41·3	·7228 ·7219 ·7188 ·7181
41 — 10·5584	21 1 10·63	—10 6 7·2	·2580 ·2589
— 9·5648	21 1 48·39	— 9 26 54·0	·2995 ·2996
— 10·5588	21 2 2·38	— 9 50 10·0	·4424 ·4415
42 — 12·5872	20 54 18·90	—11 39 53·9	·2779 ·2784
— 12·5882	20 56 17·67	—11 41 8·4	·2563 ·2562
— 11·5484	20 56 31·40	—10 54 32·2	·4658 ·4654
43 — 12·5872	20 54 18·90	—11 39 53·9	·2779 ·2784
— 12·5882	20 56 17·67	—11 41 8·4	·2563 ·2562
[— 11·5485]	20 56 37·73	—10 53 47·8	·4658 ·4654
44 — 18·5705	20 28 33·50	—18 15 12·4	·2379 ·2357 ·2336
— 18·5706	20 28 59·28	—18 18 39·3	·5881 ·5909 ·5935
— 18·5714	20 32 33·87	—17 57 37·4	·1740 ·1734 ·1729
45 — 20·5936	20 24 12·23	—20 0 58·9	·3390 ·3390 ·3391
— 20·5945	20 25 45·87	—19 51 25·3	·0970 ·0973 ·0974
— 19·5829	20 26 51·39	—19 15 31·0	·5641 ·5636 ·5635
46 — 21·5716	20 22 32·95	—21 19 15·1	·5942 ·5949 ·5972
— 21·5719	20 23 56·72	—20 58 24·5	·2984 ·2974 ·2939
— 21·5724	20 25 37·94	—21 17 41·1	·1074 ·1077 ·1090
47 — 21·6158	22 2 1·38	—20 56 2·8	·5219 ·5202 ·5183
— 21·6166	22 4 52·30	—21 0 11·8	·3624 ·3637 ·3647
— 20·6370	22 7 30·89	—20 15 59·1	·1157 ·1161 ·1170
48 — 14·3640	13 2 45·45	—14 49 57·6	+1·3859+1·3979+1·4152+1·4264
— 14·3644	13 3 48·62	—14 38 56·9	—1·1126—1·1292—1·1529—1·1684
— 13·3657	13 5 23·51	—14 1 15·8	+ ·7267+ ·7313+ ·7377+ ·7420

TABLE 3 *(continued)*.

B.D.	α 1950·0	δ 1950·0	dependences
°	h m s	° ′ ″	
49 — 12·3719	12 52 29·75	—13 10 54·6	·4621 ·4661
— 12·3722	12 53 12·96	—13 20 34·6	·1575 ·1539
— 12·3729	12 55 12·45	—12 51 51·4	·3804 ·3800
50 — 11·3365	12 44 41·38	—12 0 22·3	·1419 ·1437
— 11·3373	12 46 31·01	—11 53 26·3	·6034 ·5983
— 11·3374	12 46 45·32	—11 39 36·1	·2547 ·2580
51 — 10·3535	12 39 35·33	—10 54 37·3	·1000 ·1008
— 10·3544	12 41 48·31	—11 2 43·2	·2123 ·2105
— 10·3546	12 42 28·18	—10 43 36·6	·6877 ·6887
52 — 1·2346	10 4 12·53	— 2 8 59·6	·4236 ·4236
— 1·2347	10 4 21·44	— 1 28 48·9	·3477 ·3460
— 1·2358	10 8 39·54	— 1 44 11·3	·2287 ·2304
53 + 0·2565	9 47 38·87	+ 0 0 20·7	·2879 ·2981
— 0·2258	9 48 10·75	— 0 56 28·7	·4843 ·4829
+ 0·2568	9 48 37·28	+ 0 4 18·8	·2278 ·2190
54 + 1·2352	9 41 4·13	+ 0 42 59·1	·1396 ·1426
+ 0·2548	9 41 45·09	— 0 3 59·0	·4249 ·4256
+ 0·2554	9 43 39·79	+ 0 14 6·6	·4356 ·4318
55 + 0·2546	9 39 49·97	— 0 3 4·9	·3280 ·3359
+ 1·2352	9 41 4·13	+ 0 42 59·1	·5654 ·5678
+ 0·2548	9 41 45·09	— 0 3 59·0	·1065 ·0963
56 + 1·2316	9 28 0·62	+ 1 28 38·0	·1923
+ 2·2214	9 28 48·48	+ 2 29 57·8	·0640
+ 2·2217	9 30 6·55	+ 2 5 13·6	·7436
57 + 2·2212	9 27 17·38	+ 2 25 8·5	+·7113 +·7126 +·8138 +·8154
+ 2·2214	9 28 48·48	+ 2 29 57·8	—·2565 —·2558— ·1064 —·1056
+ 2·2217	9 30 6·55	+ 2 5 13·6	+·5452 +·5432 +·2926 +·2902
58 + 4·2184	9 22 24·01	+ 4 13 36·3	+·9790 +·9779
+ 4·2185	9 22 45·80	+ 4 30 7·3	—·9829 —·9812
+ 4·2187	9 23 25·52	+ 4 29 3·5	+1·0039+1·0033
59 + 5·2191	9 30 7·16	+ 5 20 43·6	·2528
+ 5·2197	9 32 1·57	+ 5 12 49·3	·4116
+ 5·2200	9 32 24·88	+ 4 58 45·7	·3357
60 — 9·2959	9 52 31·27	— 9 55 58·3	·4030 ·3998
— 9·2962	9 53 12·75	— 9 36 7·4	·4102 ·4148
— 9·2967	9 54 54·63	— 9 38 48·7	·1868 ·1853
61 — 6·3040	9 54 47·44	— 7 8 16·9	+·6358 +·6337
— 5·2954	9 55 49·67	— 6 21 52·4	+·4698 +·4713
— 6·3045	9 56 2·81	— 6 56 44·3	—·1056 —·1050
62[— 5·2952]	9 55 29·48	— 5 45 52·6	·3046 ·3061
— 5·2953	9 55 30·88	— 6 13 0·0	·1874 ·1851
— 5·2977	10 0 21·26	— 5 41 6·8	·5079 ·5088
63 + 13·704	4 36 49·95	+13 34 35·6	·5282 ·5271 ·5228
+ 12·622	4 36 46·43	+13 1 50·1	·0905 ·0908 ·0918
+ 13·708	4 40 12·69	+13 22 33·6	·3813 ·3822 ·3854
64 + 11·651	4 44 50·39	+11 41 54·5	·0944 ·0934
+ 12·653	4 45 45·26	+12 50 20·0	·5273 ·5268
+ 11·655	4 46 22·21	+11 45 56·2	·3783 ·3798
65[+ 9·670]	4 49 17·17	+ 9 23 24·6	·1809 ·1737
+ 9·671	4 49 36·89	+ 9 15 18·2	·6677 ·6771
+ 8·795	4 51 4·14	+ 9 6 52·7	·1514 ·1492
66 + 8·778	4 48 0·33	+ 8 43 1·5	·5141 ·5148
+ 9·675	4 50 43·30	+ 9 24 35·0	·3519 ·3502
+ 8·795	4 51 4·14	+ 9 6 52·7	·1340 ·1350

TABLE 3 *(continued)*.

B.D.	α 1950·0	δ 1950·0	dependences
	h m s	° ′ ″	
67 + 8°778	4 48 0·35	+ 8 43 1·5	·6518 ·6506 ·6483 ·6470
[+ 8·783]	4 49 8·22	+ 8 25 34·0	·2312 ·2346 ·2410 ·2446
+ 8·792	4 50 26·68	+ 8 32 19·0	·1170 ·1148 ·1107 ·1083
68[+ 9·3293]	16 51 11·70	+ 9 20 9·1	·2890 ·2907 ·2959 ·2977
[+ 8·3302]	16 52 46·32	+ 8 48 22·0	·4810 ·4778 ·4698 ·4668
+ 8·3306	16 53 53·05	+ 8 49 51·7	·2301 ·2315 ·2343 ·2355
69 + 10·3080	16 47 18·26	+ 10 45 14·9	·6337 ·6362
+ 10·3085	16 49 36·96	+ 10 28 13·8	·1564 ·1494
+ 10·3086	16 50 12·75	+ 10 31 36·2	·2099 ·2143
70 + 12·3064	16 39 23·26	+ 12 7 0·7	·3344 ·3361
+ 11·3031	16 41 22·04	+ 11 33 35·4	·2478 ·2466
+ 12·3078	16 42 17·52	+ 12 19 44·9	·4178 ·4173
71 + 13·3167	16 31 31·43	+ 13 29 59·0	·3203 ·3170
[+ 12·3038]	16 31 6·64	+ 12 40 5·2	·5165 ·5147
+ 13·3162	16 30 11·39	+ 13 15 54·6	·1633 ·1684
72 + 13·3126	16 19 35·80	+ 13 34 28·1	·5457 ·5461
+ 13·3134	16 21 40·41	+ 12 58 48·1	·2142 ·2118
+ 13·3121	16 17 9·61	+ 12 46 37·1	·2400 ·2421
73 + 13·3103	16 14 8·59	+ 13 35 43·6	·2995 ·3135
+ 13·3110	16 15 45·32	+ 13 10 24·3	·3153 ·2872
+ 12·2991	16 16 24·95	+ 12 42 1·9	·3852 ·3993
74 + 12·2971	16 10 25·88	+ 12 42 29·5	+·4887
+ 13·3094	16 11 41·09	+ 13 25 41·1	—·4610
+ 13·3099	16 13 13·87	+ 13 16 30·6	+·9723
75 + 13·3081	16 8 25·89	+ 12 52 35·8	·1741 ·1765
+ 12·2966	16 9 23·86	+ 12 11 57·7	·3420 ·3429
+ 13·3089	16 10 37·57	+ 12 55 34·8	·4838 ·4806
76 + 12·2952	16 6 29·44	+ 12 14 48·8	·6783
+ 13·3081	16 8 25·89	+ 12 52 35·8	·1591
+ 12·2966	16 9 23·86	+ 12 11 57·7	·1626
77 + 11·2901	16 0 21·37	+ 11 5 59·2	·5822 ·5834
+ 10·2950	16 1 45·10	+ 10 8 32·6	·3281 ·3300
+ 11·2907	16 2 36·45	+ 11 5 1·8	·0897 ·0865
78 + 3·3141	16 8 36·40	+ 3 2 37·8	·3636 ·3628
+ 3·3143	16 9 44·03	+ 3 43 34·3	·3301 ·3289
+ 3·3151	16 11 51·26	+ 2 46 26·9	·3063 ·3083
79 + 3·3141	16 8 36·40	+ 3 2 37·8	·4932 ·4916
+ 3·3151	16 11 51·26	+ 2 46 26·9	·2552 ·2580
+ 3·3157	16 13 21·62	+ 3 11 31·5	·2517 ·2504
80 + 15·4915	23 55 25·51	+ 15 40 36·0	·3180 ·3174
+ 14·5080	23 57 17·22	+ 15 30 15·5	·4779 ·4776
+ 15·4921	23 58 21·12	+ 16 7 0·8	·2041 ·2051
81 + 16·5037	0 1 36·72	+ 17 9 32·2	·5462 ·5469 ·5470
+ 16·5041	0 2 57·44	+ 16 49 21·0	·3017 ·3017 ·3017
+ 17·5	0 6 4·62	+ 17 39 2·4	·1521 ·1515 ·1513
82 + 16·5037	0 1 36·72	+ 17 9 32·2	·5765 ·5754 ·5727
+ 16·5040	0 2 26·09	+ 17 1 43·4	·2223 ·2242 ·2287
+ 16·1	0 4 55·04	+ 17 1 28·2	·2012 ·2004 ·1986
83 + 16·5037	0 1 36·72	+ 17 9 32·2	·5019 ·5026 ·5063 ·5073
+ 16·5039	0 2 8·16	+ 16 47 31·6	·2671 ·2682 ·2719 ·2731
+ 16·5040	0 2 26·09	+ 17 1 43·4	·2310 ·2292 ·2218 ·2196
84 + 16·5028	23 58 45·50	+ 17 10 35·0	·3710 ·3709 ·3712
+ 15·4924	23 59 50·23	+ 16 8 56·7	·2855 ·2856 ·2867
+ 16·5039	0 2 8·16	+ 16 47 31·6	·3436 ·3435 ·3421

TABLE 3 *(continued)*.

B.D.	α 1950·0	δ 1950·0	dependences
°	h m s	° ′ ″	
85 + 15·4907	23 53 29·18	+ 16 1 44·7	·3146 ·3146 ·3144
+ 14·5077	23 54 41·49	+ 15 19 54·2	·3992 ·3994 ·4018
+ 15·4921	23 58 21·12	+ 16 7 0·8	·2862 ·2860 ·2837
86 + 14·5069	23 51 16·07	+ 15 12 14·1	+·7063 +·7065 +·7076 +·7079
+ 13·5185	23 52 0·82	+ 14 19 16·5	+·5711 +·5718 +·5743 +·5751
+ 14·5074	23 53 20·67	+ 14 57 7·4	—·2775 —·2783 —·2819 —·2830
87 + 12·5024	23 45 18·83	+ 12 56 40·2	·3693 ·3694
+ 14·5064	23 47 47·51	+ 14 35 42·0	·3644 ·3644
+ 12·5033	23 48 50·22	+ 13 29 17·5	·2663 ·2662
88 + 8·5093	23 35 6·09	+ 9 9 58·5	·5503 ·5508
+ 8·5095	23 37 21·87	+ 9 24 1·6	·0935 ·0919
+ 9·5254	23 37 14·61	+ 9 47 35·3	·3562 ·3572
89 + 7·5059	23 32 54·30	+ 8 14 36·6	·4575 ·4573
[+ 6·5175]	23 34 39·84	+ 7 27 6·3	·1303 ·1308
+ 7·5066	23 36 19·57	+ 8 2 12·0	·4122 ·4119
90 + 7·5060	23 33 3·08	+ 8 26 26·4	·3743 ·3744
+ 6·5178	23 34 50·56	+ 7 20 48·5	·5769 ·5771
+ 7·5066	23 36 19·57	+ 8 2 12·0	·0487 ·0485
91 + 6·5174	23 33 42·37	+ 6 35 4·3	+·8420 +·8421
[+ 6·5176]	23 34 41·96	+ 6 50 11·4	—·7076 —·7057
+ 6·5178	23 34 50·56	+ 7 20 48·5	+·8655 +·8636
92 + 3·4887	23 37 8·45	+ 3 53 25·0	+·2569 +·2588
+ 4·5036	23 37 44·81	+ 4 31 42·1	+·7482 +·7438
+ 4·5040	23 39 22·94	+ 4 41 16·5	—·0051 —·0026
93 + 15·1568	7 22 42·20	+ 15 48 56·8	·1477 ·1464
+ 15·1564	7 21 36·56	+ 15 36 57·0	·7139 ·7102
+ 16·1464	7 20 22·86	+ 15 55 47·0	·1384 ·1434
94 + 16·1459	7 19 15·33	+ 15 51 11·6	·2365 ·2416
+ 16·1463	7 20 19·54	+ 16 5 4·6	·0788 ·0876
+ 16·1464	7 20 22·86	+ 15 55 47·0	·6847 ·6708
95 + 17·1538	7 15 28·22	+ 17 5 44·8	·2909 ·2874
+ 17·1533	7 14 6·42	+ 17 25 30·8	·3083 ·3118
+ 17·1530	7 12 24·62	+ 17 0 35·6	·4008 ·4007
96 + 18·1529	7 10 56·84	+ 17 51 13·4	·3836 ·3854
+ 17·1529	7 12 11·79	+ 17 33 49·5	·2394 ·2367
+ 18·1540	7 12 19·91	+ 18 5 52·8	·3769 ·3779
97 + 18·1524	7 9 25·05	+ 18 44 19·1	·1593 ·1598
+ 18·1532	7 11 20·02	+ 18 6 57·8	·4305 ·4289
+ 18·1538	7 11 55·80	+ 18 38 57·4	·4102 ·4113
98 + 18·1524	7 9 25·05	+ 18 44 19·1	·1281 ·1265
+ 19·1650	7 10 59·00	+ 19 0 28·0	·0858 ·0883
+ 18·1538	7 11 55·80	+ 18 38 57·4	·7861 ·7851
99 + 0·2410	8 49 56·96	— 0 16 28·7	·7702 ·7761
+ 0·2412	8 50 23·95	+ 0 1 51·6	·1012 ·1011
+ 0·2414	8 51 15·75	— 0 21 19·5	·1285 ·1228
100 + 1·2139	8 34 10·83	+ 1 2 45·9	·4123 ·4163
+ 1·2140	8 34 36·34	+ 0 55 34·7	·1896 ·1900
+ 1·2142	8 35 46·46	+ 0 52 0·9	·3981 ·3937
101 + 1·2118	8 29 53·19	+ 1 40 49·3	·2826 ·2859
+ 2·2002	8 31 3·82	+ 1 45 29·6	·1209 ·1199
+ 1·2127	8 31 36·99	+ 1 18 23·7	·5966 ·5942
102 + 1·2111	8 28 27·98	+ 1 30 24·3	·3997
+ 2·1996	8 28 49·89	+ 2 3 48·6	·2451
+ 2·2002	8 31 3·82	+ 1 45 29·6	·3552