

PHOTOGRAPHIC POSITIONS OF BRIGHT MINOR PLANETS AND PLUTO

C.E. López¹, J.G. Sanguin, and M.R. Cesco

Felix Aguilar Observatory and Yale Southern Observatory
Argentina

Received 1988 October 17

RESUMEN

Se dan coordenadas ecuatoriales de asteroides brillantes y el planeta Plutón. Las placas fotográficas fueron obtenidas durante 1987 con el telescopio astrográfico doble de 20 pulgadas de Yale Southern Observatory. Las estrellas de referencia fueron seleccionadas del AGK3 o SAO dependiendo de la declinación del objeto.

ABSTRACT

Equatorial coordinates for some bright minor planets and Pluto have been measured on direct photographs taken during 1987 with the 20-inch Yale Southern Observatory double astrograph. Reference stars were taken from the AGK3 or SAO depending on the declination of the object.

Key words: ASTROMETRY – PLANETS

I. INTRODUCTION

Since its dedication on March 31 1965, the Yale Southern Observatory and Felix Aguilar Observatory (San Juan University, Argentina), have been surveying the southern sky for the Southern Proper Motion program (SPM). The observing station is located in the province of San Juan (Argentina) at $\lambda = 4^{\text{h}}37^{\text{m}}19.002^{\text{s}}$ (west), $\phi = -31^{\circ}48'8.2''$ at an altitude of 2348m. Details about the telescope can be seen in Wesselink (1974) while the status of the program has been reported by López (1982), López, Lee, and van Altena (1986) and van Altena, Girard, and López (1987).

Even though the telescope is used most of the time to the observation of the SPM program, the observation of solar system objects is also included in the schedule of the instrument. So far, around 6000 individual positions of asteroids and comets as well as some positions of Jupiter's satellites have been published. In addition, more than 40 new asteroids and 5 comets have been discovered during the last 20 years.

II. OBSERVATIONS AND REDUCTION

The minor planets included in this study were selected from the Ephemerides of Minor Planets for 1987, while the ephemerides for Pluto were taken from Kaplan, Seidelmann, and Smith (1972). All observations were recorded on Kodak 103a-O plates which were exposed

5 to 10 minutes using the blue lens of the 20-inch double astrograph. Eight to ten reference stars were taken from the AGK3 for positive declinations while for positions south of the equator, the SAO was used. The exception to this rule is asteroid (41) Daphne for which only AGK3 stars were used for both the October and November positions (see Table 1). Each plate was measured in the direct and reverse positions with the manual measuring machine of the Felix Aguilar Observatory. The reductions utilized the method of least-squares with three unknowns including linear terms in the coordinates and a zero point. The average standard error of the derived positions is the same in both RA and DEC, namely $\pm 0.50''$ or $\pm 0.35''$, depending on whether SAO or AGK3 reference stars were used.

Table 1 lists the topocentric right ascension and declination for equinox 1950.0.

TABLE 1

PHOTOGRAPHIC POSITIONS OF BRIGHT MINOR PLANETS AND PLUTO

Object	Epoch (UT)	RA			(1950) DEC		
		h	m	s	°	'	''
(16) Psyche	1987 05 22.03357	10	29	09.17	+10	54	50.8
	05 22.05365	10	29	09.76	+10	54	47.4
(18) Melpomene	1987 06 27.97306	13	22	45.60	+03	19	15.2
	06 27.99384	13	22	45.94	+03	19	09.1
(24) Themis	1987 06 26.05747	15	15	16.53	-18	35	07.4
	06 26.07825	15	15	16.12	-18	35	05.5

1. Current address: Yale Astronomy Dept., P.O. Box 6666, New Haven, CT 06511 U.S.A.

TABLE 1 (CONTINUED)

Object	Epoch (UT)	RA			(1950) DEC		
		h	m	s	°	'	"
(25) Phocaea	1987 06 25.09967	15	43	27.49	+06	21	45.3
	06 25.12045	15	43	27.02	+06	21	52.6
(32) Pomona	1987 10 24.15850	01	16	58.83	+10	35	28.3
	10 24.17374	01	16	58.06	+10	35	21.5
	11 20.08167	01	00	11.85	+07	54	42.4
	11 20.10106	01	00	11.41	+07	54	36.7
(37) Fides	1987 05 28.19136	17	05	28.73	-27	01	50.3
	06 26.13226	16	38	04.78	-26	23	05.1
	06 26.15304	16	38	03.62	-26	23	02.6
(40) Harmonia	1987 10 15.21840	02	19	47.22	+06	29	23.4
	10 15.23918	02	19	46.01	+06	29	18.0
	10 20.21998	02	15	01.36	+06	06	49.8
	10 20.24076	02	15	00.11	+06	06	44.3
	11 20.13049	01	46	48.64	+04	41	34.2
(41) Daphne	1987 10 22.25123	03	30	04.52	+02	44	56.5
	10 22.32014	03	30	01.68	+02	44	29.3
	11 24.17532	03	04	58.09	-00	11	37.0
	11 24.19956	03	04	56.95	-00	11	42.2
(44) Nysa	1987 11 24.23245	04	51	50.16	+16	24	58.3
	11 24.25323	04	51	48.94	+16	24	56.7
(45) Eugenia	1987 06 25.06089	14	55	01.93	-06	40	13.1
	06 25.08167	14	55	01.75	-06	40	16.2
(51) Nemausa	1987 10 19.23553	02	23	49.77	+04	09	54.6
	10 19.25976	02	23	48.46	+04	09	41.2
	11 24.12511	01	54	38.57	+00	13	28.0
	11 24.14727	01	54	37.81	+00	13	24.0
(52) Europa	1987 10 22.34126	05	14	34.41	+13	49	07.5
	10 22.35511	05	14	36.13	+13	49	08.2
(54) Alexandra	1987 06 24.06155	15	37	25.13	-36	54	56.4
	06 29.02504	15	35	27.88	-36	11	45.9
	06 29.04582	15	35	27.49	-36	11	35.0
(68) Leto	1987 06 29.22519	19	15	10.17	-33	43	58.5
	06 29.25081	19	15	08.75	-33	44	05.2
(69) Hesperia	1987 10 16.07023	22	36	47.42	-05	41	29.1
	10 16.09101	22	36	47.04	-05	41	35.6
	10 20.05723	22	35	50.50	-05	58	26.3
	10 20.07801	22	35	50.21	-05	58	30.8
	10 22.10579	22	35	28.83	-06	06	20.5
	10 22.12657	22	35	28.63	-06	06	24.8
(78) Diana	1987 05 28.28901	19	00	14.98	-33	32	09.7
	05 28.30633	19	00	14.27	-33	32	13.3
	06 29.18432	18	32	28.80	-33	59	37.8
	06 29.20510	18	32	28.81	-33	59	37.0
(97) Klotho	1987 06 29.13031	17	06	07.15	-06	38	34.6
	06 29.15108	17	06	05.81	-06	38	37.6
(103) Hera	1987 06 26.09417	15	48	14.14	-12	23	09.3
	06 26.11495	15	48	13.52	-12	23	09.9
	06 29.06382	15	46	51.88	-12	26	56.5
	06 29.08460	15	46	51.29	-12	26	58.3
(111) Ate	1987 10 17.02664	21	04	56.42	-13	39	12.7
	10 17.04742	21	04	56.75	-13	39	10.9
	10 22.01403	21	06	38.90	-13	31	00.0
	10 22.03827	21	06	39.47	-13	30	57.6
(129) Antigone	1987 10 24.25096	02	03	40.89	-04	59	23.1
	10 24.26827	02	03	40.05	-04	59	28.1
	11 24.07421	01	42	44.29	-06	10	11.7
	11 24.09845	01	42	43.58	-06	10	10.4
(198) Ampella	1987 06 02.20680	17	27	21.71	-26	09	08.0
	06 02.22757	17	27	20.44	-26	09	02.0
	06 25.14538	17	02	51.57	-24	04	38.8
	06 25.16616	17	02	50.21	-24	04	30.5
(216) Kleopatra	1987 05 21.04149	10	57	13.23	-02	03	52.4
	05 21.07266	10	57	13.83	-02	03	48.0

TABLE 1 (CONTINUED)

Object	Epoch (UT)	RA			DEC		
		h	m	s	°	'	"
(287) Nephthys	1987 10 16.27592	03	29	20.36	+02	38	17.0
	10 16.29670	03	29	19.59	+02	38	07.9
	10 22.25123	03	25	21.35	+01	56	35.8
	10 22.27477	03	25	20.21	+01	56	25.2
(308) Polyxo	1987 06 27.00626	13	40	29.22	-06	20	03.5
	06 27.02704	13	40	29.65	-06	20	06.2
(313) Chaldaea	1987 10 24.33441	06	20	38.98	+07	40	28.0
	10 24.35103	06	20	39.60	+07	40	20.0
(375) Ursula	1987 10 15.16646	23	34	33.46	+10	14	48.6
	10 15.18723	23	34	32.55	+10	14	46.3
	10 17.14853	23	33	14.21	+10	11	01.6
	10 17.16931	23	33	13.44	+10	10	59.6
(385) Ilmatar	1987 10 17.07512	22	17	35.39	-10	08	48.0
	10 17.09590	22	17	34.95	-10	08	45.4
	10 22.06320	22	16	29.57	-10	00	21.1
(387) Aquitania	1987 10 24.29321	05	23	42.51	+02	18	34.1
	10 24.31052	05	23	42.20	+02	18	29.9
	10 16.23229	01	40	07.86	-02	41	45.6
(423) Diotima	1987 10 19.21129	01	37	40.44	-02	48	48.7
(432) Pythia	1987 06 25.22295	19	00	52.74	-26	49	31.8
	06 25.24373	19	00	51.48	-26	49	44.3
(532) Herculina	1987 06 24.98333	12	59	18.93	+13	30	58.1
	06 25.00410	12	59	19.94	+13	30	40.8
Pluto	1987 04 23.20555	14	44	32.21	+01	45	06.5
	05 27.13142	14	41	39.09	+01	58	14.7
	06 01.10842	14	41	02.09	+01	58	21.7
	06 22.00952	14	39	26.31	+01	57	03.0
	06 28.04716	14	39	06.03	+01	55	33.1

We would like to thank H. Mira, J. Torres, and J. Vicentela for taking and measuring some of the plates involved in this report. This study was supported in part by a USA National Science Foundation Grant to the Yale Southern Observatory.

REFERENCES

- Kaplan, G.H., Seidelmann, P.K., and Smith, E. 1972, *U.S. Nav. Obs., Circ. No. 139*.
 López, C.E. 1982, *Bol. Asoc. Argentina Astron.*, No. 27, p. 263.
 López, C.E., Lee, J.-F., and van Altena, W.F. 1986, in *IAU Symposium No. 109, Astrometric Techniques*, eds. H.K. Eichhorn and R.J. Leacock (Dordrecht: D. Reidel), p. 209.
 van Altena, W.F., Girard, T., and López, C.E. 1987, in *IAU Colloquium No. 100, Fundamentals of Astrometry*, eds. H.K. Eichhorn and A.R. Upgren (to be published in *Celest. Mech.*).
 Wesselink, A.J. 1974, in *IAU Symposium No. 61, New Problems in Astrometry*, eds. W. Gliese, C.A. Murray, and R.H. Tucker (Dordrecht: D. Reidel), p. 201.

Mario R. Cesco, Carlos E. López, and Juan G. Sanguin: Felix Aguilar Observatory and Yale Southern Observatory, Avda. Benavidez 8175, 5413 Chimbass, San Juan, Argentina.