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ASTROMETRIC OBSERVATIONS OF THE FAINT SATELLITES OF JUPITER DURING THE 1975-1976 OPPOSITION

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ABSTRACT

Precise positions for the faint satellites VI-XII of Jupiter during the 1975-76 opposition have been obtained from plates taken with the 2.1 m Otto Struve reflector of the McDonald Observatory. Positions of several asteroids were secured incidental to those of the satellites, and these are given also.

I. INTRODUCTION

This paper continues the series of astrometric observations of the satellites of the trans-martian planets re-established at the McDonald Observatory in 1972. We present here the positions deduced from photographic observations of the jovian system obtained during the 1975-76 opposition, together with the discovery positions of four asteroids found on these plates.

II. OBSERVATIONS

During the five months beginning 1975 October, a total of 25 plates were exposed on the faint satellites of Jupiter, using the 2.1 meter Otto Struve reflector of the McDonald Observatory at Mt. Locke. These included unsuccessful attempts at obtaining measurable images of Amalthea (Jupiter V) and the suspected fourteenth satellite (1975J1) discovered by Kowal during September of that same opposition. The remaining plates contained a total of 18 images of satellites VI-XIII, as well as images of four asteroidal objects. All of these exposures were made on Kodak 103aD plates sensitized by pre-flashing, with no filters or magnitude compensation. Some were manually guided, while others were guided with the aid of the Rybski autoguider, with successful exposures ranging up to 120-minute duration (the attempt at 1975J1 was 180 minutes, guided manually). Tracking at satellite rate was accomplished by offsetting the plate holder from the camera at the appropriate predicted rate, with the offset direction established by rotation of the telescope tailpiece collar. Due to the special interest in the then

newly-discovered thirteenth satellite, the six successful observations of that object have already been published outside the chronological sequence (Mulholland and Shelus 1977; Benedict, Shelus and Mulholland 1978, hereafter referred to as Paper I), and they are not included in the list presented here.

III. REDUCTION PROCEDURE

The observations presented below were measured and reduced with the quasi-automatic PDS microdensitometer system described in Paper I, to which readers are directed for all pertinent details.

IV. DISCUSSION OF RESULTS

The results of the plate reductions are given in Table 1, in a form homogeneous with the data of Paper I. That is, the positions are given as topocentric astrometric (i.e. no E-term correction) right ascension and declination in the fixed coordinate system of the mean equator and equinox of B1950.0, based on the coordinate frame defined by the SAO catalogue. The stated uncertainties (ε_α, ε_δ) are formal standard deviations from the solutions in the two coordinates, computed as the quadratic sums of the formal standard deviations for the plate solutions for the PSS field and for the observation plate. The uncertainty in the determination of the centroids of the individual images is much smaller than these contributions (typically 10-20 microdegrees) and has thus been neglected. Of course, systematic errors in the catalogue are not represented in these values. The number of SAO stars used in the determination of the secondary reference frame is given as $*_1$ and the

number of secondary stars used in the actual observation plate reduction is $*_2$. Except as indicated in the notes, all positions are based on single exposures. For a discussion of the rationale of the data format, see Abbot, Mulholland and Shelus (1975).

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We are grateful to our measurers M. A. Dritschel, J. Higdon and R. Wilbourn for their diligent efforts with the PDS machine. This work is supported by the National Aeronautics and Space Administration, under grant NGR 44-012-282.

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Table 1: Observed positions of satellites and minor planets. Observer and measurer codes: A = R. I. Abbot, D = M. A. Dritschel, H = J. Higdon, M = J. D. Mulholland, S = P. J. Shelus, W = R. Wilbourn.

Object	Julian Date (UTC) - 2442000	α_{1950} (deg)	δ_{1950}	ε_α (deg × 10^5)	ε_δ	$*_1$	$*_2$	Obs	Meas	Notes
Jupiter VI	692.95544	18.73267	+ 5.79738	8	10	20	30	M	M	ab
	695.77285	18.46064	+ 5.66983	19	12	20	27	M	DHM	
	808.60417	17.99536	+ 6.83944	14	13	77	19	MS	HWM	
Jupiter VII	719.64826	15.32588	+ 5.24819	26	14	42	16	A	DHW	b
	781.65061	14.25783	+ 4.56683	24	17	42	27	MS	A	b
	782.61042	14.34613	+ 4.59944	24	17	42	28	MS	A	
Jupiter VIII	808.60417	18.05053	+ 6.68015	14	13	77	19	MS	HWM	
Jupiter IX	694.92361	20.25771	+ 7.41292	15	11	20	33	M	DHM	
	720.60041	16.92165	+ 5.93021	16	13	20	21	A	DH	b
Jupiter X	695.77285	18.32777	+ 5.53090	19	12	20	27	M	DHM	
	808.60417	18.09388	+ 6.85860	14	13	77	19	MS	HWM	
Jupiter XI	695.82049	16.49196	+ 5.85810	14	10	58	18	M	DH	
Jupiter XII	719.75174	17.29315	+ 4.39180	20	12	20	27	A	DHW	b
1950XV		58.63146	+19.32890	6	7	21	--	--	M	c
1975TC6	694.64318	19.06192	+ 6.54391	14	11	20	20	M	DHW	a
1975TD6	694.64318	19.18835	+ 6.59448	14	11	20	20	M	DHW	a
1975TE6	694.69444	18.58565	+ 4.87315	14	11	62	24	M	HW	
1975TF6	694.69444	18.4271	+ 4.6681	200	120	62	24	M	HW	d

Table 1 (continued)

Notes:

a Normal point formed from two exposures on the same plate

b Image fuzzy

c Mean epoch of exposure is JD 2433624.7441 GMT (E plate +18 04 00)

d Long trail, very faint; uncertainties are subjective estimates based on repeatability of measures.