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RESEARCH NOTE: PHOTOMETRY OF ASTEROIDS 359 GEORGIA AND 789 LENA

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RESUMEN

Se presenta fotometría CCD de los asteroides 359 y 789. Las observaciones se hicieron durante 1993 en la Estación Astronómica "Dr. Carlos Ulrrico Cesco" del Observatorio Félix Aguilar, San Juan, Argentina. Para el planeta menor 359 Georgia se ha obtenido un período de rotación confiable, mientras que para 789 Lena sólo se presenta un límite inferior debido a la complejidad de su curva de luz.

ABSTRACT

CCD photometry of asteroids 359 and 789 are herein presented. The observations were made during 1993 at Estación Astronómica "Dr.Carlos Ulrrico Cesco" of Félix Aguilar Observatory, San Juan, Argentina. For minor planet 359 Georgia a reliable rotation period has been obtained, while for 789 Lena only an inferior limit is given due to the complexity of its lightcurve.

Key words: **MINOR PLANETS**

1. INTRODUCTION

Enlarging the observational data base of rotational properties of asteroids may allow significant conclusions to be drawn regarding the collisional evolution of the asteroid belt (Harris & Burns 1979; Tedesco & Zappala 1980; Farinella, Paolicchi, & Zappala 1981; Dermott, Harris, & Murray 1984) and gain insights into the cosmogonically important distribution of spin axis orientation (Magnusson 1986). Furthermore, the precise determination of rotational periods could provide a tool to decide about the physical reality of certain Hirayama families (Gil-Hutton, Licandro, & Gallardo 1995). Thus I have performed a regular program of photoelectric photometry of asteroids whose main goal is the lightcurve determination (Gil-Hutton 1988). The present paper summarizes lightcurve data for asteroids 359 Georgia and 789 Lena from two observing runs during 1993.

2. OBSERVATIONS

The observations were made with the 76-cm cassegrain telescope of Estación Astronómica "Dr. Carlos Ulrrico Cesco" of Félix Aguilar Observatory, San Juan, Argentina and a 2×2-binned Texas Instruments 1024×1024 CCD camera, giving an image scale of 0.4 arcsec per pixel and a field of view of 3.4 arcmin. Typical positional uncertainties of ±0.5 arcmin usually allowed to locate the asteroid within an image frame centered on the predicted position. An asteroid's identity was certified through detection and measurement of its motion vector. Due to the brightness of the target asteroids, always in the range $V = 13$ to 14, the telescope was tracked at sidereal rate and an exposure of 180 sec was used. Differential photometry in the standard R magnitude was carried out using background stars as local comparisons due to their closeness to the asteroids. These stars have not been standardized due to the presence of thin cirrus clouds during the observing runs.

Flat field images were obtained using the evening and morning twilight sky. More than ten bias frames were obtained during the course of each night to monitor the noise level of the CCD, where the mean remained constant to within less than 1 ADU. Also, five dark frames with exposures greater than 300 sec were obtained each night to test the dark current of the chip, but its mean remained constant at the bias level. All image processing, including bias and dark subtraction and flat field corrections, was performed using the Image Reduction and Analisis Facility (IRAF) software package developed by the National Optical Astronomy Observatories (NOAO). Magnitudes for the asteroid and at least two com-

TABLE 1

OBSERVING CONDITIONS

Asteroid	Date	λ (1950.0)	β	α	Δ	r
359 Georgia	Apr 22 1993	243.31	−07.25	−11.11	1.925	2.823
	Apr 24 1993	243.04	−07.35	−10.47	1.908	2.820
789 Lena	May 20 1993	231.97	00.82	02.76	1.361	2.369
	May 23 1993	231.30	01.09	04.28	1.362	2.366
	May 25 1993	230.86	01.27	05.28	1.365	2.364

parison stars were extracted from each image using the technique of aperture photometry.

Aspect data for all observing nights are given in Table 1 including the date, geocentric longitude (λ) and latitude (β) of the asteroid, its phase angle (α) and its geocentric (Δ) and heliocentric (r) distances. The observations were corrected for light-time.

3. RESULTS

To search for rotational periods the data obtained were analized using the Phase Dispersion Minimization (PDM) method proposed by Stellingwerf (1978), which is a generalization of Lafler & Kindman (1965) method and allows an arbitrary degree of smoothing and provides complete statistical information. The data about taxonomic classification is from Tholen (1989).

3.1. 359 Georgia

This CX-type asteroid was observed previously by Lagerkvist (1978) who suggests a period of 7.3 hs. Two nights of observations show that this reported period is not correct, but using the data presented here it was possible to construct a composite lightcurve (Figure 1) and find a period of 13.25 ± 0.09 hs which also adjusts very well to Lagerkvist's data. The lightcurve shows an amplitude of 0.545 mag and unequal maxima and minima.

3.2. 789 Lena

This asteroid was observed during three nights but there are not enough data to deduce a period. A composite lightcurve is shown in Figure 2, based on a period of 21.98 hs which is the shortest period allowed from the PDM solutions. The lightcurve shows an amplitude greater than 1.515 mag and is extremely complex. There is no information available in the literature about taxonomic type and diameter (Tedesco 1989) for this asteroid, but its lightcurve suggests a very irregular object like a small fragment produced by a collision.

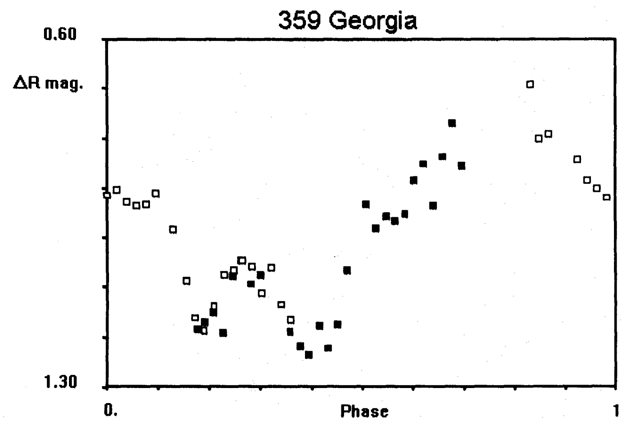

Fig. 1. Composite R lightcurve for asteroid 359 Georgia. Data for 04/22/93 are shown with filled squares and for 04/24/93 with squares.

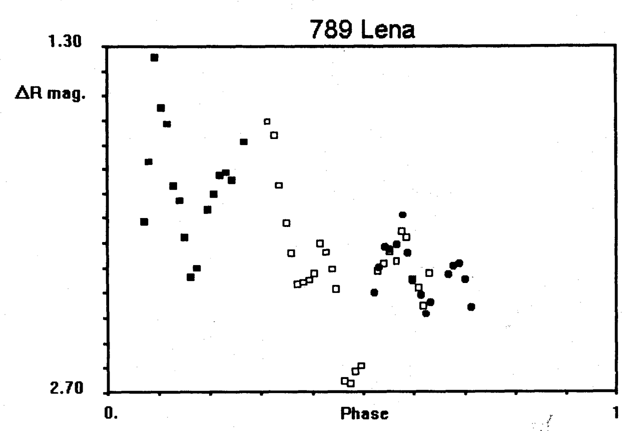

Fig. 2. Composite R lightcurve for asteroid 789 Lena. Data for 05/20/93 are shown with filled squares, for 05/23/93 with squares and for 05/25/93 with filled circles.

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