CCD PHOTOMETRY OF ASTEROID 1113 KATJA

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CCD photometry of asteroid 1113 Katja taken during December 2001 and January 2002 at the Sunflower, Blackberry and Universidad de Monterrey Observatories is reported. A synodic rotation period of 18.465 ± 0.010 hours was determined from six nights of observations. The observed lightcurve was nearly symmetrical with an amplitude of 0.18 ± 0.01 magnitudes.

Observations

The observations of 1113 Katja reported here were made at the Sunflower (MPC 739), Blackberry (MPC 929) and Universidad de Monterrey (MPC 720) Observatories. The telescopes used to gather the data were computerized 12-inch f/10 SCTs at Blackberry and Sunflower Observatories (the latter one working at f/7), and a 7-inch f/15 (working at f/10) Maksutov at Universidad de Monterrey. The electronic imagers used were SBIG ST-9E CCDs at Sunflower and Monterrey, while Blackberry had an AP-7 CCD. The target was selected from a list of asteroid photometry opportunities published in the *Minor Planet Bulletin* (Pravec, Harris and Warner, 2002). Data were collected on 2001 December 29 at Blackberry, 2001 December 30, 31 and 2002 January 1 at Sunflower, and 2002 January 15 and 16 at Monterrey. All dates are UT. A total of 419 unfiltered images were used in the analysis. The exposures for the images were of 2 minutes at Sunflower, 3 minutes at Blackberry, and 4 minutes at Monterrey. Standard dark current and flat field corrections were applied to the data. Three to five stars were used in each image as magnitude comparisons for the asteroid. Sunflower and Blackberry Observatories measured the asteroid relative magnitude variations from the field stars present. At the Universidad de Monterrey Observatory a nearby star field was identified from the 'LONEOS Photometric Calibration Star List' (Skiff, 2002) and this field was observed each January night. Stars with known Johnson R magnitudes were used to determine the magnitudes of the asteroid comparison stars in this case.

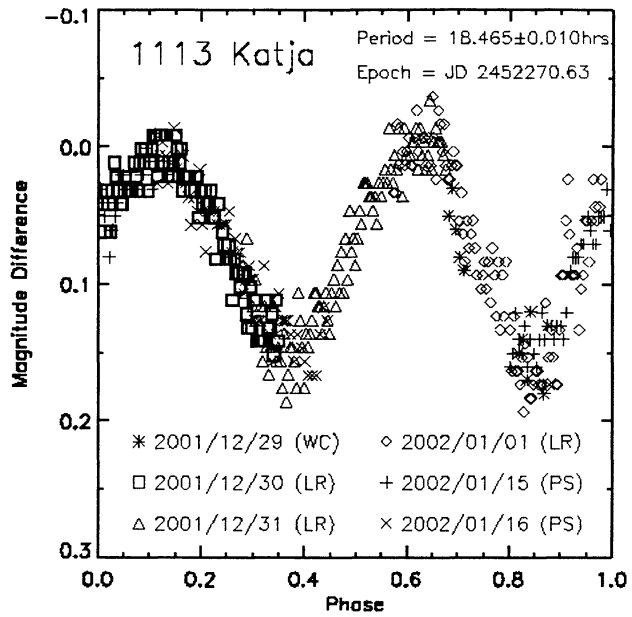

Figure 1: Composite lightcurve of asteroid 1113 Katja derived from 419 observations based on a 18.465 ± 0.010 hour rotation period.

Results

Times were corrected for light travel time from the asteroid to the Earth and were taken to be at the mid-times of the image exposures. Relative magnitudes from night to night were uncertain as different comparison stars were used. This was dealt with by using additive constants to bring all the data into the best agreement possible. These shifts also accounted for the intrinsic magnitude variation of the asteroid due to its change of distance with respect to the Earth, and to phase angle variations (14.1°-7.7°). The magnitude differences reported are relative since no calibrated data were acquired using standard photometric filters. The best-fit rotational period for the asteroid was obtained by computing the power spectrum of the time series of data (Scargle, 1982; Horne and Baliunas, 1986).

The resulting synodic rotational period for 1113 Katja from the data presented here is 18.465 ± 0.010 hours (See Figure 1). There are two similar maxima and minima per rotation. The amplitude of the lightcurve is 0.18 ± 0.01 magnitudes for the unfiltered bandpasses. The time scale is given in rotational phase with the zero corresponding to a maximum brightness on 2002 December 27 at 2.120 hrs UTC (JD 2452270.63000). This is probably the first reported rotational period for the asteroid since it is not listed in A. Harris' 'Minor Planet Lightcurve Parameters' list (Harris, 2001).

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ASTEROID PHOTOMETRY AT OAKLEY OBSERVATORY

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A lightcurve for asteroid 1289 Kutaissi was measured on the nights of October 20 and October 25, 2001 as a first attempt at asteroid photometry at the Oakley Observatory located near Terre Haute, IN. The data from the two nights yield a period of 3.624 ± 0.006. This result agrees nicely with a previously published period of 3.60 ± 0.04 hours and confirms the methods used for collecting and processing the data.

I began making asteroid astrometry measurements at the Rose-Hulman Institute of Technology Observatory (MPC 731) in the Fall of 1998. Asteroid astrometry was chosen as an astronomy research project because it was relatively easy for my students to learn to do. In the summer of 2000, the equipment was moved to a new building called the Oakley Observatory (MPC 916) where asteroid astrometry continued. Since the move, thousands of asteroid astrometry measurements have been made and submitted to the Minor Planet Center by 14 different students, and a total of 33 asteroids have been discovered by six different students.

A major topic of discussion at the 2001 Minor Planet Amateur Professional Workshop was the fact that asteroids in need of astrometric measurement are becoming increasingly faint, but there are still many relatively bright asteroids in need of photometric measurement. So I decided to try my hand at asteroid photometry in the Fall of 2001. I selected asteroid 1289 Kutaissi from the list of asteroid lightcurves published by Harris (2001) because it had a short period, large amplitude and was well placed in October, 2001.

The instrument used to gather the data was an 11-inch f/10 Schmidt-Cassegrain telescope and an unfiltered AP-7 CCD camera. The telescope is on a Paramount GT-1100 mount and the mount and camera are controlled by the Internet Astronomy Suite by SoftwareBisque. Observations were made by preparing an Orchestrate script which ran most of each night. TheSky was used to determine the time of meridian crossing so that a meridian flip could be included in the orchestrate script. Data were collected on 2001 October 20 and 25. A total of 87 images were used in the analysis. The exposures were all two minute long. Dark frames were automatically subtracted as the images were taken by the camera control software (CCDSoft). The images were flat fielded by median combining the images themselves to create a flat field frame using MaxImDL. A nearby star field which contained several Landolt stars was used for calibration to set the photometry parameters in the program Canopus. A total of five comparison stars were used in each asteroid image. Different comparison stars were used on the two nights, so the magnitude of the October 20 data was adjusted to match the October 25 data.

Using Canopus to analyze the data resulted in a period of 3.624 ± 0.006 hours. This result is shown in Figure 1. The small uncertainty is a result of combining data from observations spaced five nights apart. Adding one complete revolution during those five nights results in a period of 3.519 ± 0.007 hours. This later solution gives a noticeably poorer fit to the data and does not agree with Binzel (1987) who found a period of 3.60 ± 0.04 hours using data from two consecutive nights.

I conclude from the results given above that I and my students are capable of producing accurate lightcurve measurements. We will be pursuing other asteroids in the near future.

References

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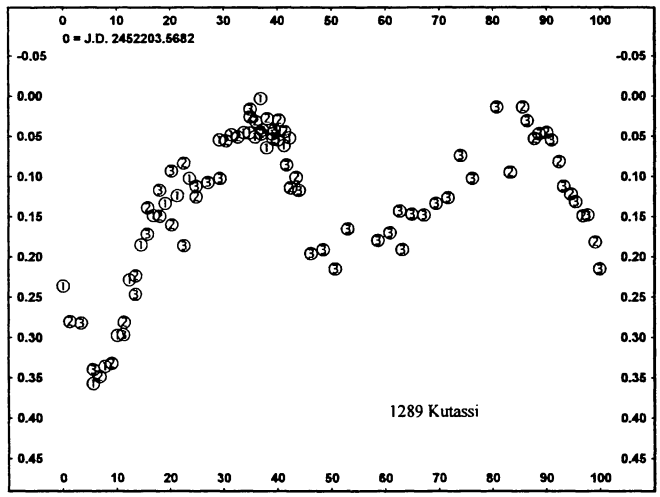

Figure 1. Oakley Observatory lightcurve of 1289 Kutaissi based on a period of 3.624 ± 0.006 hours.