

ROTATION PERIOD DETERMINATION FOR 247 EUKRATE

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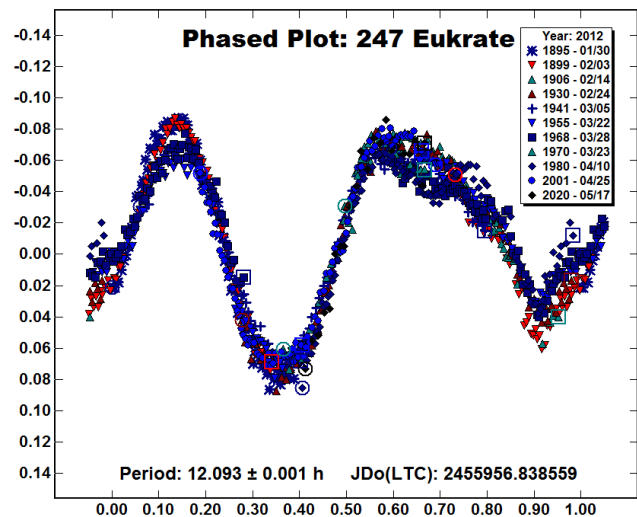
Analysis of observations from North America and Australia of the nearly Earth-commensurate asteroid 247 Eukrate obtained over an interval of more than three months resulted in finding a unique rotation period of 12.093 ± 0.001 h, amplitude 0.14 ± 0.02 mag.

Observations made by FP at the Organ Mesa Observatory were made using a Meade 35-cm LX-200 GPS Schmidt-Cassegrain (SCT) and SBIG STL-1001E CCD with an R filter. Exposures were 60 seconds, unguided. Analysis used differential photometry only. Observations by SD, GA, and TB, made remotely at Grove Creek Observatory, used a 25-cm SCT, SBIG STL-1001E CCD, and clear filter. Exposures were 30 seconds. Image measurement, lightcurve analysis, and data sharing were done with *MPO Canopus*. Because of the large number of data points, the data for the lightcurves presented here have been binned in sets of three points with a maximum time interval between points no greater than 5 minutes.

Previous period determinations for 247 Eukrate include 12 hours (Schober and Surdej, 1979) and 12.10 hours (Harris and Young, 1980), who based their results on a more extensive data set. For an object with a period believed to be very close to Earth-commensurate, a series of lightcurves over a long time interval is required for full phase coverage. Observations at Organ Mesa Observatory began 2012 Jan 30, more than a month before opposition, and were obtained on 9 nights at intervals of 5 to 20 days through April 25 to cover the full cycle twice. These have been supplemented by additional observations on 2012 March 23 and May 17 from Grove Creek Observatory, New South Wales, Australia, to sample phases of the lightcurve on dates greatly differing from those on which it could be observed from Organ Mesa. Full phase coverage was also achieved for the double period, for which the two halves look almost identical to each other, and for which the double period can be safely rejected. We find an unambiguous period of 12.093 ± 0.001 h, amplitude 0.14 ± 0.02 magnitudes, in excellent agreement with Harris and Young (1980).

References

- Harris, A.W. and Young, J.W. (1980). "Asteroid Rotation III. 1978 Observations." *Icarus* **43**, 20-32.
- Schober, H.J. and Surdej, J. (1979). "UBV Photometry of the Asteroids 9 Metis, 87 Sylvia, and 247 Eukrate during their oppositions in 1978 with respect to Lightcurves." *Astron. Astrophys. Suppl. Ser.* **38**, 269-274.



EPOCH DATA IN SIDEREAL PERIOD DETERMINATION. I. INITIAL CONSTRAINT FROM CLOSEST EPOCHS

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Spin vector determination methods that use epoch information require establishing correct rotation counts over long time spans, which can involve ambiguities that are not necessarily correctly handled by purely statistical methods. I present an approach that can be used prior to spin vector analysis, to begin to check how well a given set of lightcurve epoch data can constrain the sidereal period. I also present two precepts to maximize the impact of observing efforts in cases where more epoch data are needed.

Introduction

To determine a rotation period from lightcurves, the time interval Δt elapsed between observations of some "epoch," such as a repeating feature, is divided by the number of rotations n_{rot} that occurred during the time interval:

$$P = \Delta t / n_{\text{rot}} \quad (\text{Eq. 1})$$

If the lightcurve is not also observed sufficiently between the epochs, then establishing the number of rotations that occurred can be subject to ambiguity. Determining the correct number of elapsed rotations therefore is essential to determining the correct period. Incorrect periods calculated using incorrect numbers of elapsed rotations are known as alias periods.

Spin vector analyses can make use of epoch information in rotation lightcurves to determine an object's pole orientation and direction of spin. Doing so necessarily involves determining the sidereal rotation period, thus a prerequisite for spin vector analysis using epoch information is determining the correct numbers of rotations