Multi-color lightcurve observation of the asteroid (163249) 2002 GT

M. Oshima[1] and S. Abe[1]

[1]Department of Aerospace Engineering, Nihon University

NASA's Deep Impact/EPOXI spacecraft plans to encounter the asteroid (163249) 2002 GT, classified as a PHA (Potentially Hazardous Asteroid), on January 4, 2020. However, the taxonomic type and spin state of 2002 GT remain to be determined. We have carried out ground-based multi-color (B-V-R-I) lightcurve observations taking advantage of the 2002 GT Characterization Campaign by NASA. Multi-color lightcurve measurements allow us to estimate the rotation period and obtain strong constraints on the shape and pole orientation. Here we found that the rotation period of 2002 GT is estimated to be 3.7248 ± 0.1664 h.

In mid-2013, 2002 GT passed at 0.015 au from the Earth, resulting an exceptional opportunity for ground-based characterization. Using the 0.81-m telescope of the Tenagra Observatory (110∘52'44.8"W, +31∘27'44.4"N, 1312 m) in Arizona, USA, and the Johnson-Cousins BVRI filters, we have found lightcurves of 2002 GT (Figure). The Tenagra II 0.81-m telescope is used for research of the Hayabusa2 target Asteroid (162173) 1999 JU_3.

The lightcurves (relative magnitude) show that the rotation period of 2002 GT, the target of NASA's Deep Impact/EPOXI spacecraft, is estimated to be 3.7248 ± 0.1664 hr. On June 9, 2013, we had 7 hours of ground-based observations on 2002 GT from 4:00 to 11:00 UTC. The number of comparison stars for differential photometry was 34. Because of tracking the fast-moving asteroid, it was necessary to have the same comparison star among the fields of vision. We have also obtained absolute photometry of 2002 GT on June 13, 2013.

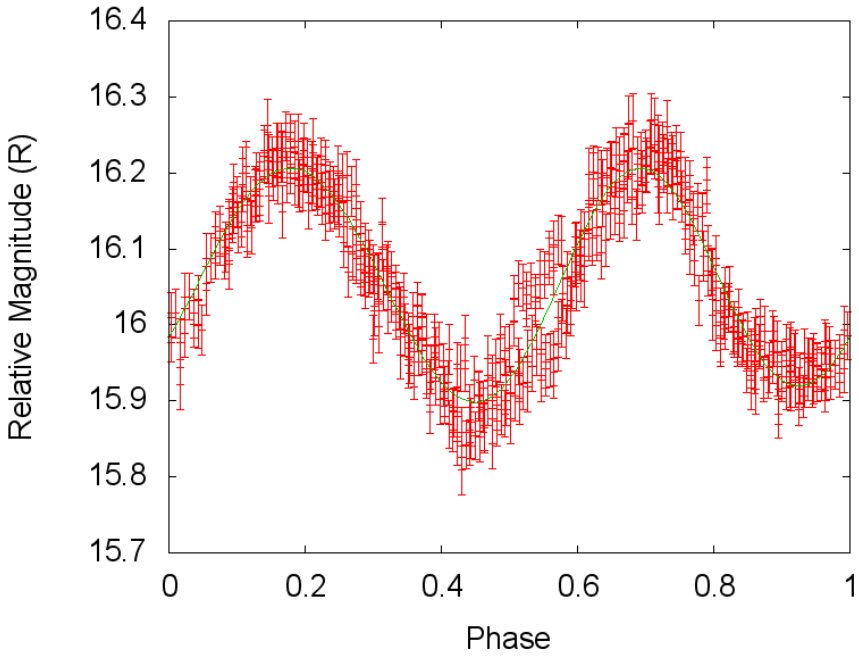

Figure: Observed lightcurves of the asteroid 2002 GT on June 9, 2013. The horizontal axis is the rotational phase and the vertical axis is the relative R-band magnitude. The error bars are calculated on error spreading.

References: Grebow, D. J. et al. Search & Selection for Future Flyby Targets for the DI/EPOXI Spacecraft. AIAA 2012-5070, AIAA/AAS Astrodynamics Specialist Conference, Minneapolis, Minnesota, August 13–16th 2012; Nicholas A. M. et al. Rotational characterization of Hayabusa II target Asteroid (162173) 1999 JU3. Icarus 224 (2013) 24–31.