Lightcurve Survey of V-Type Asteroids in the Inner Asteroid Belt

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To constrain the rotational rate distribution of asteroids sourced from asteroid 4 Vesta, the lightcurves of 13 V-type asteroids: 1933 Tinchen, 2011 Veteraniya, 2508 Alupka, 3657 Ermolova, 3900 Knezevic, 4005 Dyagilev, 4383 Suruga, 4434 Nikulin, 4796 Lewis, 6331 1992 FZ1, 8645 1998TN, 10285 Renemichelsen, and 10320 Reiland were observed using the 1.05 m Schmidt telescope and the 0.30 m Dall–Kirkham telescope (K.3T) at the Kiso Observatory (MPC code 381), the 0.36 m Ritchey–Chrétien telescopethe at the Miyasaka Observatory (MPC code 366), the 0.50 m Classical–Cassegrain telescope (MITSuME) at the Okayama Astrophysical Observatory (MPC code 371), the 1.05 m Cassegrain telescope at the Misato Observatory (no MPC code), and the 2.24 m telescope (UH88) in Hawaii (MPC code 568). Using past lightcurve data archive for V-type asteroids and our observations with the exception of 4434 Nikulin and 10285 Renemichelsen, we determined the rotational rates of V-type asteroids (e.g., Fig. 1, 2) [1].

The distribution of rotational rates of 59 V-type asteroids which includes our 11 new and 48 previous results in the inner main belt, including 29 members of the Vesta family, which are regarded as being ejecta from the asteroid 4 Vesta, is not consistent with the best-fit Maxwellian distribution. This inconsistency may be due to the effect of thermal radiation Yarkovsky–O'Keefe–Radzievskii–Paddack (YORP) torques, which implies that the collision event that formed vestoids is sub-billion to several billion years in age [1]. This is consistent with numerical simulations of the Vesta family [2] and crater counting of asteroid 4 Vesta by the Dawn mission [3].

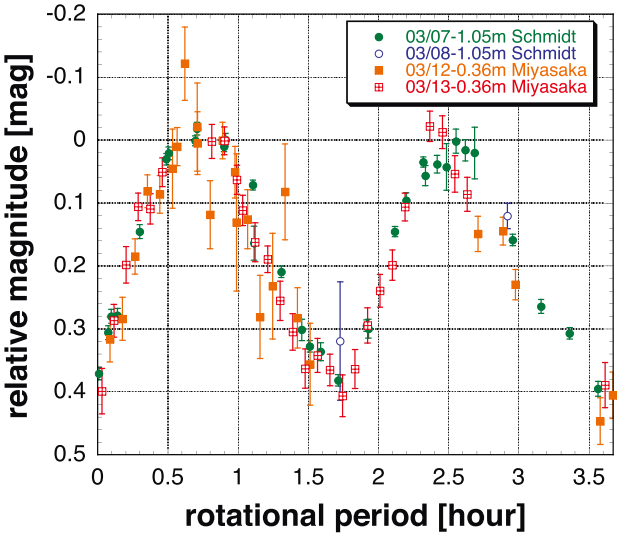

Figure 1: Composite rotational lightcurve of the asteroid 1933 Tinchen.

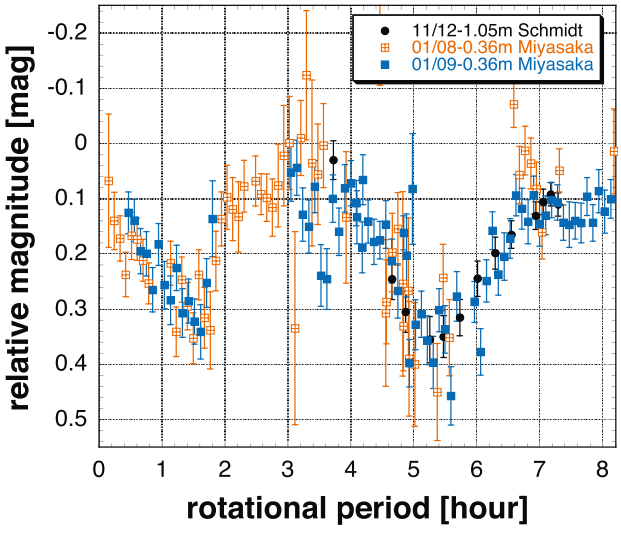

Figure 2: Composite rotational lightcurve of the asteroid 2011 Veteraniya.

References

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