Lightcurve Survey of V-type Asteroids. Observations until 2005. S. Hasegawa[1], S. Miyasaka[2], H. Mito[3], Y. Sarugaku[1], T. Ozawa[4], D. Kuroda[5], S. Nishihara[1,6], A. Harada[6], M. Yoshida[5], K. Yanagisawa[5], Y. Shimizu[5], S. Nagayama[5], H. Toda[5], K. Okita[5], N. Kawai[7], M. Mori[8], T. Sekiguchi[9], M. Ishiguro[10], and M. Abe[1]

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Introduction: The asteroid 4 Vesta is considered to be the smallest terrestrial planet because it is the only differentiated asteroid with an intact internal structure with a basaltic surface, an ultramafic mantle, and a metal core. Zappalà et al.[1] inferred that Vesta has its asteroid family and Monthé-Diniz et al. [2] reported that the Vesta family has about 4500 members. Many asteroids with Vesta-like visible spectra which are usually called 'V-type asteroids' were found at near-Earth orbit [3] and in the inner main-belt which was surrounded with 3:1 mean motion resonance and ν6 secure resonance of Jupiter [4]. We have started lightcurve observations of V-type asteroids in the inner main-belt (semimajor axis $2.1 < a < 2.5$) since 2003 fall and obtained rotational rates along with variation of amplitude ([5],[6]). To increase the number of reliable rotation rate for statistically meaningful studies, the lightcurve observations of V-type asteroids were carried out.

Observations and data reduction: Observational survey of lightcurves for V-type asteroids was carried out at six different telescopes. lightcurve data were recorded using the 1.05-m Schmidt telescope and the 0.30-m Dall-Kirkham telescope at the Kiso Observatory in Nagano, Japan (MPC code 381), the 0.36-m Ritchey-Chrétien telescope at the Miyasaka Observatory in Yamanashi, Japan (MPC code 366), the 0.50-m Classical-Cassegrain telescope (MITSuME) the Okayama Astrophysical Observatory in Okayama, Japan (MPC code 371), the 1.05-m Cassegrain telescope at the Misato Observatory in Wakayama, Japan (non-having MPC code), and the UH88 telescope in Hawaii, USA (MPC code 568). Light images reduction including dark subtraction and flat-field correction were performed by the Image Reduction and Analysis Facility (IRAF) software. The asteroids and the comparison stellar stars were measured thorough a cycle aperture with a diameter of three times of the full-width half maximum size by the APPOT task of IRAF. All lightcurves has been constructed using relative magnitudes. The fluxes of 5-20 comparison stars in the same frame of the asteroid were measured. The light-travel time were corrected to obtain accurate lightcurve epoch.

Results of rotational periods: Lightcurves of 20 V-type asteroids and 13 asteroids are by-productions for V-type asteroid observations have been obtained. We have determined rotation periods of 18 V-type asteroids: 1933 Tinchen 3.671 h, 2011 Veteraniya 8.209 h, 2508 Alupka 17.70 h, 2511 Patterson 4.144 h [6], 2640 Hallstrom 22.90 h [6], 2653 Principia 5.5218 h [6], 2795 Lepage ~60.4 h [6], 3307 Athabasca 4.901 h [6], 3657 Ermolova 2.582 h, 3900 Knezevic 5.324 h, 4005 Dyagilev 6.400 h, 4147 Lennon ~137 h [6], 4383 Suruga, 3.811 h, 4796 Lewis 3.508 h, 4977 Rauthgundis 61.2 h [6], 6331 1992 FZ1 9.333 h, 8645 1988 TN 7.616 h, 10320 Reiland, 5.920 h. We also found rotaion periods of 11 non V-type asteroids: 477 Italia (S-type) 19.32 h, 1455 Mitchella (A-type) >12 h [6], 3192 A'Hearn (C-type) 3.160 h [6], 6664 Tennyo ~2.9 h [6], 10389 Robmanning 2.8 h, 10443 van de Pol 3.3 h, 11321 Tosimatsumoto (XL-type) 7.80 h, 18590 1997 YO10 (S-type) 3.0 h, 22034 1999 XL168 3.4 h, 41051 1999 VR10 4.0 h, 46121 2001 FB36 (C-type) 4.2 h.

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