MEASURING SENSE OF ROTATION OF V-TYPE ASTEROIDS OUTSIDE THE VESTA FAMILY

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Introduction: Most Howardite-Eucrite-Diogenite (HED) meteorites are thought to originate from a single parent body – asteroid (4) Vesta. Few HEDs show oxygen isotope ratios that indicate origin in other parent bodies. In this study we try to identify V-type asteroids in the inner main belt that can be set apart from typical Vestoids and Vesta fugitives and thus might represent parent bodies of those anomalous HEDs. We focus on the inner main belt as the most likely source of meteorites.

The main premiss of this study is that in order to evolve outside the Vesta family boarders asteroids have to produce the correct Yarkovsky drift. In particular retrograde rotators migrate inwards the Solar System and prograde rotators outside. Therefore the key property is sense of rotation.

Method: We determined senses of rotation by measuring synodic periods of the selected objects before, during and after opposition. This allows us to see the changes in synodic period as the asteroid moves toward and away from opposition. Prograde rotators have their synodic period increasing when they move away from opposition (minimum at opposition) while retrograde rotators have a maximum synodic period at opposition [1,3]. The amount of the change in synodic period depends on orientation of the rotational pole.

Results: Overall our sample included eleven V-type asteroids outside the dynamical Vesta family. The distribution of the prograde and retrograde rotators in orbital element space is shown in Fig 1. Five of the observed objects ((1946) Walraven, (5150) Fellini, (5599) 1991TS4, (6406) 1992 MJ and (18641) 1998EG10 can be directly explained by migration from the Vesta family. The origin

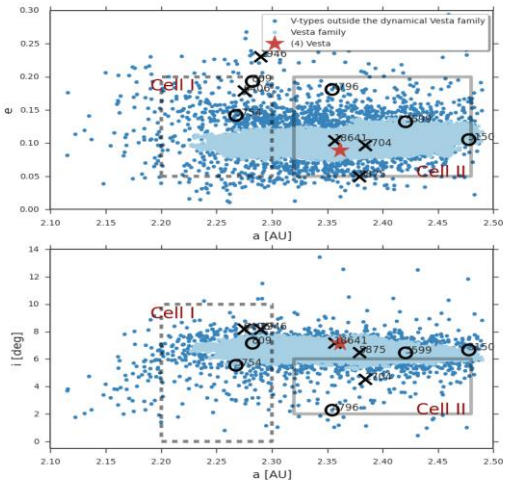

Figure 1. Distribution of the prograde (circles) and retrograde (crosses) V-type rotators in the inner main asteroid belt. Location of asteroid (4) Vesta is denoted with a red star. Vesta family and V-type candidates outside the Vesta family are marked. Cell I (dashed-line square) and Cell II (solid-line square) regions are denoted as in [2].

of three other objects ((2704) Julian Loewe, (4796) Lewis, (5875) Kuga) is ambiguous. Two asteroids ((809) Lundia and (5754) 1992 FR2) are the least likely to have a genetic connection to Vesta.

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References: [1] Dykhuis et al. (2015) Icarus 267, 174-203, [2] Nesvorný et al., (2008) Icarus 193, 85-95, [3] Oszkiewicz et al. (2017), submitted to A&A