

# The V-type conundrum: are other basaltic objects out there?

S. Ieva (1,2,3), D. Lazzaro (4), E. Dotto (1), D. Perna (2), M. C. De Sanctis (5), D. Fulvio (6), and M. Fulchignoni (2)

(1) INAF – Osservatorio astronomico di Roma, Italy (2) LESIA – Observatoire de Paris, France, (3) Università di Roma TorVergata, Italy, (4) Observatorio Nacional, MCT, Brasil, (5) INAF-IAPS, Rome, Italy (6) Laboratory Astrophysics Group of the Max Planck Institute for Astronomy, Germany (simone.ieva@oa-roma.inaf.it)

## Abstract

The majority of V-type objects in the main belt are dynamically connected to the largest basaltic asteroid known, (4) Vesta, although others, due to their current orbital parameters, cannot be easily linked to Vesta and could be fragments of another differentiated asteroid. We present a statistical analysis of previously published visible and infrared V-type spectra, with the intent to compare dynamical families and study the possibility that some of these V-type asteroids have actually a different mineralogy from Vesta, suggesting a possible different origin.

## 1. Introduction

In the last decades several main belt asteroids have been found showing a basaltic composition, similar to those of Vesta and basaltic HED achondrite meteorites. The majority of these objects, classified as V-type according the most recent taxonomy [1], are thought to be originated from a huge collisional event on the south pole of Vesta [2], and show orbital parameters ( $a, e, i$ ) close to Vesta itself.

V-type asteroids were also found outside the boundaries of the dynamical family: while at least one group could be considered as “*fugitives*” [3] from the Vesta family through resonant and/or non-gravitational effects, it is difficult to explain other “*V-types non vestoids*” not conventionally linked to Vesta. Some of them reside on the other side of the 3:1 resonance, like (1459) Magnya and (21238) Panarea [4,5], and according to the current dynamical models, it would be very unlikely that a fragment survived through the passage of such a powerful resonance. In the absence of a suitable dynamical transportation mechanism there is a possibility that

these objects are fragments of other basaltic object(s).

## 2. Statistical analysis

We analysed visible and NIR spectra of V-type asteroids belonging to different dynamical families (vestoids, fugitives, V-type NEOs and V-type non vestoids) to highlight possible differences among dynamical classes and compare them with HED meteorites. We made use of several spectral parameters (reflectivity gradients, band centres, band separation) to infer mineralogical properties [6,7], as well as Modified Gaussian Model to state different pyroxene composition [8].

Finally we compared band parameters from V-types with data available from the Visible and InfraRed spectrometer (VIR) on board of the Dawn mission [9], who mapped almost the whole surface of Vesta in 2011-2012. All of the data are currently under analysis and the results will be presented at the EPSC meeting.

## References

- [1] DeMeo, F. E., Binzel, R. P., Slivan, S. M. et al. 2009, *Icarus*, 202, 160
- [2] Marchi, S., McSween, H. Y., O'Brien, D. P. et al. 2012, *Science*, 336, 690
- [3] Nesvorny, D., Roig, F., Gladman, B. et al. 2008, *Icarus*, 193, 85
- [4] Lazzaro, D., Michtchenko, T., Carvano, J. M. et al. 2000, *Science*, 288, 2030

[5] Binzel, R. P., Masi, G., Foglia, S. 2006, BAAS, 38, 627

[6] Gaffey, M.J., Cloutis, E. A., Kelley, M.S. et al. 2002 in Asteroids III, University of Arizona Press, 183

[7] Burbine, T. H., Buchanan, P. C., Dolkar, T. et al. 2009, M&PS, 44, 1331

[8] Mayne, R. G., Sunshine, J. M., McSween, H.Y. et al. 2011, Icarus, 214, 147

[9] De Sanctis, M. C., Coradini, A., Ammannito, E. et al. 2011, SSRv, 163, 329