

Minor bodies of the Solar System: geology and structures

Matteo Massironi

ESA-Rosetta and NASA-Dawn space missions have by now obtained plenty of data on minor bodies which have demonstrated an unsuspected geological history shown by morphological and compositional variegations, characteristic structural and stratigraphic frameworks and diverse degradation processes (De Sanctis et al., 2012; Williams et al. 2014; Sierks et al. 2015, Thomas et al., 2015). Of particular relevance in the up-coming years will be 67P/Churyumov-Gerasimenko (67P/CG) comet around which Rosetta spacecraft is orbiting and Vesta and Ceres bodies imaged by the Dawn mission.

Possible PhD projects aim to study spectral properties as well as structural and morphological characters of asteroids and/or comets with particular regard to Vesta, Ceres, Lutetia and 67P/CG. In all cases the analysis should be carried out through remote sensing interpretation of optical and spectroscopic images, studies of shape models and 3D geo-modelling. Part of the research projects will include also mineralogical and petrographic characterization of analogue materials and their spectroscopic analysis. A specific attention should be paid to the relationships between spectral diversity and surface morphologies of minor bodies considering the effects of aggregation, differential sublimation, gravitational phenomena and thermal stress processes on comets, and cratering effects and gravitational phenomena on asteroids. As far as comets are concerned it is expected that the research will shed light on the origin, evolution and degradation of these objects. On the other hand, studies dedicated to Vesta and Ceres, which are the most massive bodies of the asteroid belt, might reveal how rocky (Vesta) and icy (Ceres) proto-planets form, grow and evolve.

Research Funds: PhDs that will be involved in projects on 67P/CG comet will be supported by ASI-CISAS and ASI-INAF funds respectively dedicated to Rosetta-OSIRIS and Rosetta-VIRTIS instrument teams. PhD activities on asteroids will be supported by INAF-IAPS funds.

References:

- De Sanctis, M.C. et al. 2012. Spectroscopic characterization of mineralogy and its diversity across Vesta. *Science* 336, 697–700.
- Sierks, H., et al. 2015. On the nucleus structure and activity of comet 67P/Churyumov-Gerasimenko. *Science*, Vol 347, Issue 6220. 1044-1-5
- Williams, D. a., Yingst, R.A. & Garry, W.B., 2014. Introduction: The geologic mapping of Vesta. *Icarus* 244, 1–12.
- Thomas, N. et al. 2015. The morphological diversity of comet 67P/Churyumov-Gerasimenko. *Science*, Vol 347, Issue 6220. aaa0440-1-6.