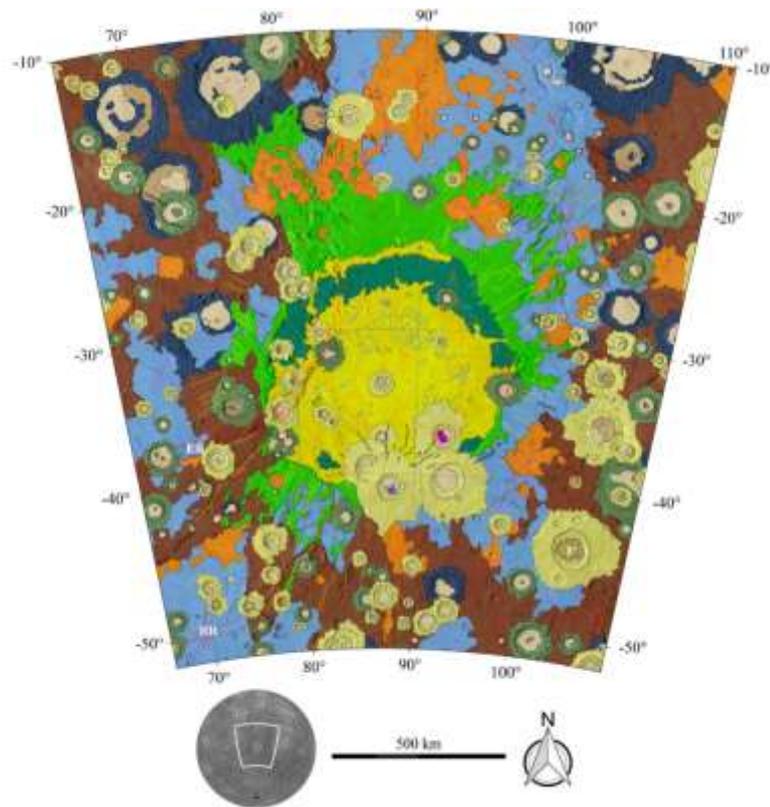


# Volcanism and Tectonism across Mercury

*Proposer: Prof. Matteo Massironi*

Interpretation, mapping and age estimates of tectonic and igneous features and units are pivotal for the understanding of the thermal and magmatic evolution of planetary bodies. Being of modest size Mercury is particularly suited for investigating the early stage processes of terrestrial planets evolution such as the relationship between impact basin formation, regional tectonism and magmatism of large igneous provinces. Although plate tectonics is lacking on Mercury, tectonic structures such as compressional wrinkle ridges, grabens and strike slip faulting are still present and related to tidal despinning, contractional cooling and basin tectonism interplaying with igneous activity often triggered by large basins impacts. Unravelling the tectonic settings on such planetary surfaces will allow us to get more information not only on the origin of the deformations and the associated stress fields, but also obtain constraints on the thickness and mechanical layering of the evolving crust.

It is expected that the PHD student will carry out analysis of high-resolution imagery and topographic data from MESSANGER mission and from the upcoming Bepi Colombo mission whose orbit insertion is foreseen by November 2026.



In particular the PHD should be able to deal with one or more of the following activities :

- compilation and analysis of high-resolution imagery and topographic data from orbital missions to Mercury.
- identification, characterization and mapping of volcano-tectonic structures, including fissures, grabens, and faults.
- identification, characterization and mapping of volcanic fields, lava flows, and igneous units.
- development of new methodologies for structural analysis, including 3D modelling, fracture analysis, fault kinematic and stress and strain analysis.
- comparison of structural characteristics across different volcanic provinces, and correlation with planetary magmatic evolution.
- age determination of volcanic units through crater counting.
- integration of results with existing geological maps and models, and development of new maps and cross-sections.

Hence a good background in photointerpretation of geo-structural and/or volcanic features would be required. Proficiency in GIS, remote sensing, Digital mapping and 3D modelling software is also essential whereas familiarity with programming languages such as Python and MATLAB as well as supervised and unsupervised classifications of hyperspectral data would be desirable.

Experience in geological mapping and ability to work in international teams is also well-received. Indeed the PhD will carry out his work in collaboration to SIMBIOSYS team of the Bepi-Colombo mission.

**Collaborations:** Bepi Colombo AND SIMBIOSYS team members (INAF-OAPD, INAF-IAPS, Westfälische Whilelms-Universität Münster, DLR, Observatoire de Paris).

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