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Geologic map and structural analysis of the Victoria quadrangle (H2) of Mercury based on NASA MESSENGER images

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Abstract.

The first stratigraphic and geologic study of Mercury was released by Trask & Guest (1975) followed by Spudis & Guest (1988, and references therein), whose work was based on the images taken by Mariner 10 covering 42% of the total surface of Mercury. The planet has been officially divided into fifteen quadrangles: 2 polar, 5 equatorial and 8 at midlatitudes. Quadrangle H2 (= Hermes sheet n.2), named "Victoria" (20^oN – 65^oN Lon.; 270^oE – 0^o Lat.), was partially mapped by McGill & King (1983), though a wide area (~64%) remained unmapped due to the lack of imagery. Following the terrain units recognized and described by the above authors, we have produced a geologic map of the entire quadrangle using MESSENGER (MErcury Surface, Space ENvironment, GEochemistry and Ranging) images. The images taken by the Mercury Dual Imaging System (MDIS) Wide Angle Camera (WAC) and Narrow Angle Camera (NAC) allowed us to map geologic and tectonic features in much greater detail than the previously published map (mapping scale range between 1:300k and 1:600k). We classified craters larger than 20 km using three relative age classes, which are a simplification of the past five degradation classes defined by McCauley et al. (1981). Victoria quadrangle is characterized by a localized N-S thrust array constituted by Victoria Rupes, Endeavour Rupes and Antoniadi Dorsum to the East and by a more diffuse system of NE-SW oriented fault arrays to the West: the two systems seem to be separated by a tectonic bulge. The Victoria-Endeavour-Antoniadi system has been interpreted as a fold-and-thrust belt by Byrne et al. (2014) and a previous study made on craters cross-cut by its thrusts reveals fault dips of 15-20^o and a near dip slip motion (Galluzzi et al., 2015). This

geologic map has the aim to build a regional model of its structural framework. Deciphering the geological setting of this quadrangle will bring important insights for understanding the tectonic evolution of the whole planet. Moreover, the results obtained with this study can help in the future targeting choices of the BepiColombo SIMBIOSYS instruments.

References

Byrne, P. K., Klimczak, C., Solomon, S. C, et al. 2014, Nature Geoscience, 7, 301
Galluzzi V., Di Achille G., Ferranti L., et al. 2015, Geol. Soc. Lon., Spec. Pub., 401, 313
McCauley, J.F., Guest, J.E., Schaber, G.G., et al. 1981, Icarus, 47, 184
McGill G. E., & King E. A. 1983, USGS IMAP, 1409
Spudis P. D. & Guest J. E. 1988, Stratigraphy and geologic history of Mercury, in Mercury, ed. F. Vilas, et al. (Univ. Arizona Press, Tucson), 118
Trask N. J., & Guest J. E. 1975, J. Geophys. Res., 80, 2461