EPSC Abstracts
Vol. 15, EPSC2021-789, 2021, updated on 30 Nov 2021
https://doi.org/10.5194/epsc2021-789
Europlanet Science Congress 2021

Mapping the regional tectonic asset of the Discovery quadrangle of Mercury

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The Discovery quadrangle of Mercury (H-11) located in the area between 22.5°S–65°S and 270°E–360°E encompasses structures of paramount importance for understanding Mercury's tectonics. The quadrangle is named after Discovery Rupes, a NE-SW trending lobate scarp, which is one of the longest and highest on Mercury (600 km in length and 2 km high). By examining the existing maps of this area (Trask and Dzurisin, 1984; Byrne et al., 2014), several other oblique trending structures are visible. More mapping detail could be achieved by using the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) Mercury Dual Imaging System (MDIS) imagery.

We aim at mapping the structures of H-11 at high-resolution by using MESSENGER/MDIS basemaps, in order to understand its regional tectonic history by following the work done in the Victoria quadrangle (H-2) (Galluzzi et al., 2019). Differently from H-2, located in the same longitudinal range but at opposite latitudes, this area lacks in N-S trending scarps, such as the Victoria-Endeavour-Antoniadi fault system, which dominates the northern hemisphere structural framework. The existing tectonic theories predict either an isotropic pattern of faults (global contraction) or an ordered distribution and orientation of faults (tidal despinning) for Mercury. If we expect that the existing tectonic patterns were governed by only one of the two processes or both together, it is difficult to understand how such different trends formed within these two complementary areas. The structural study done for H-2 reveals that the geochemical discontinuities present in Mercury's crust may have guided and influenced the trend and kinematics of faults in that area (Galluzzi et al., 2019). In particular, the high-magnesium region seems to be associated with fault systems that either follow its boundary or are located within it. These fault systems show distinct kinematics and trends. The south-eastern border of the HMR is located within H-11. Hence, with this study, we aim at complementing the previous one to better describe the tectonics linked to the presence of the HMR. Furthermore, this geostructural map will complement the future geomorphological map of the area and will be part of the 1:3M quadrangle geological map series which are being prepared in view of the BepiColombo mission (Galluzzi, 2019). *Acknowledgments: We gratefully acknowledge funding from the Italian Space Agency (ASI) under ASI-INAF agreement 2017-47-H.0.*

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