

Mapping of major volcanic structures on Pavonis Mons in Tharsis, Mars

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Pavonis Mons, with its 300 km of diameter and 14 km of height, is one of the largest volcanoes of Mars. It rests on a topographic high called Tharsis rise and it is located in the centre of a SW-NE trending row of volcanoes, including Arsia and Ascraeus Montes. In this study we mapped and analyzed the volcanic and tectonic structures of Pavonis Mons in order to understand its formation and the relationship between magmatic and tectonic activity. We use the mapping ArcGIS software and vast set of high resolution topographic and multi-spectral images including CTX (6 m/pixel) as well as HRSC (12.5 m/pixel) and HiRISE (~0.25 m/pixel) mosaic images. Furthermore, we used MOLA (~463 m/pixel in the MOLA MEGDR gridded topographic data), THEMIS thermal inertia (IR-day, 100 m/pixel) and THEMIS (IR-night, 100 m/pixel) images global mosaic to map structures at the regional scale. We found a wide range of structures including ring dykes, wrinkle ridges, pit chains, lava flows, lava channels, fissures and depressions that we preliminary interpreted as coalescent lava tubes. Many sinuous rilles have eroded Pavonis' slopes and culminate with lava aprons, similar to alluvial fans. South of Pavonis Mons we also identify a series of volcanic vents mainly aligned along a SW-NE trend. Displacements across recent crater rim and volcanic deposits (strike slip faults and wrinkle ridges) have been documented suggesting that, at least during the most recent volcanic phases, the regional tectonics has contributed in shaping the morphology of Pavonis. The kinematics of the mapped structures is consistent with a ENE-SSW direction of the maximum horizontal stress suggesting a possible interaction with nearby Valles Marineris. Our study provides new morphometric analysis of volcano-tectonic features that can be used to depict an evolutionary history for the Pavonis Volcano.