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LENGTHS AND DISTRIBUTION OF LAVA CHANNELS ON MARTIAN CENTRAL VOLCANOES

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Lava channels are enigmatic features found on Mars, the Moon, Venus, and Mercury that are interpreted to form when large volumes of lava flow across a surface [*1,2*]. Unlike channelized lava flows, lava channels could represent destructional processes via thermal and/or mechanical erosion [*3*]. Using THEMIS IR and a global CTX mosaic, we identified 50 channels interpreted to have formed via the eruption of lava associated with 6 central volcanoes: Hecates, Uranius, and Ceranius Tholi; Syrtis Major; Alba Mons; and Elysium Mons (and plateau). Diagnostic features of lava channels include an identifiable channel, sharp boundaries or levees, source vents, and consistent or decreasing width along their lengths. The observed channels ranged in length from 5 to 340 km and had a mean length of 51.4 km. On average, channels originated ~101 km from their respective central calderas, with ranges of 0 to 521 km. Three distinct channel morphologies emerged from these observations: simple channels (either sinuous or structurally controlled), bifurcated channels, and pit crater chain and lava channel combinations. The paucity of channels relative to other volcanic features, such as lava flows, suggest that the process(es) responsible for their formation was limited. Our preliminary results suggest that eruption rates were higher on the outer flanks of central volcanoes than near the summit, likely due to the difficulty of propagating magma up through a thick, less dense crust. These preliminary observations are consistent with existing hypotheses regarding spatiotemporal and volumetric decreases in eruption rate over time on Mars. Additionally, the identification of volcanic features on Mars that are relatively unmodified by water-related surface processes could help to constrain the recent hydrologic history of Mars. Future work will involve quantifying channel characteristics, calculating emplacement conditions, and placing the formation of lava channels within the context of Martian geologic history.

[1] Gulick and Baker (1990), JGR 95, 14,325-14,344.

[2] Hurwitz, Head, & Hiesinger (2013), Planetary and Space Science, 79-80, 1-38.

[3] Williams, Greeley, Hauber, Gwinner, & Neukum (2005), JGR 110, doi:10.1029/2004JE002377.