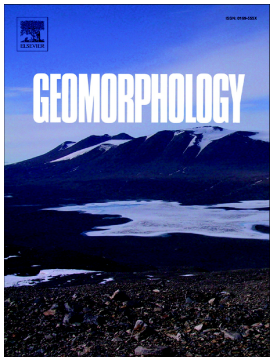

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Ridge-like lava tube systems in southeast Tharsis, Mars

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Abstract

Lava tubes are widely distributed in volcanic fields on a planetary surface and they are important means of lava transportation. We have identified 38 sinuous ridges with a lava-tube origin in southeast Tharsis. The lengths vary between ~14 and ~740 km, and most of them occur in areas with slopes <0.3°. We analyzed their geomorphology in detail with CTX (Context Camera) and HiRISE (High Resolution Imaging Science Experiment) images and DTM (digital terrain model) derived from them. We identified three cross-sectional shapes of these sinuous ridges: round-crested, double-ridged, and flat-crested and described features associated with the lava tubes, including branches, axial cracks, collapsed pits, breakout lobes, and tube-fed lava deltas. Age determination results showed that most of the lava tubes formed in Late Hesperian and were active until the Hesperian-Amazonian boundary. We proposed that these lava tubes formed at relatively low local flow rate, low lava viscosity, and sustained magma supply during a long period. Besides, lava flow inflation is also important in the formation of the ridge-like lava tubes and some associated features. These lava tubes provide efficient lateral pathways for magma transportation over the relatively low topographic slopes in southeast Tharsis, and they are important for the formation of long