Introduction: Analysis of CTX and HiRISE images has revealed a fresh lobate flow with unique morphologic characteristics (Fig. 1). The flow is ~34 km long, 0.5 – 2.0 km wide, falls ~ 50 m along its length, and has a broad distal fan ~ 6 x 9 km in size. The flow originates from within the ejecta blanket (at 0° 35′N, 155° 17′E) of a 10-km diameter impact crater, but appears to closely link to a partially buried remnant of a large yardang formed within the lower unit of the Medusae Fossae Formation.

The source area of the flow (Fig. 2) is a 1.2 x 1.5 km depression that is eroded into the yardang material. A CTX-derived digital elevation model reveals that this depression is ~20 m deep, (implying a volume of ~0.3 km³ for the removed material). Multiple phases of upwelling can be identified in the source area, where overlapping concentric ridges can be seen. Abrupt from the source area is a landform comparable to the vent structures typically seen in Martian volcanic calderas or volcanic vents [2, 3]. There is a single elevated block ~20 m high within the source area that is interpreted to be an erosional remnant from the pre-existing terrain. This block shows no signs of fluid flow around it to indicate how the surrounding material was eroded. Numerous pitted domes (red dots in Fig. 2) can also be identified.

Flow Morphology: There is a remarkable diversity of morphologies on the flow surface but, with the exception of the distal end, there is no correlation between the down-flow distance and these morphologies. Many of the textures identified here are seen in a few kilometers of the sources as well as close to the mid-end of the flow. MOLA data indicate that the flow is very thin along its length, and it is typically between 2 – 4 m thick.

Possible Mode of Formation: While the flow may be comprised of lava that had a very low viscosity during its emplacement, a more likely origin appears to be as a large mud flow. It is proposed here that this flow may have been produced by water reaching the surface within the yardang materials and the subsequent impaction of the unconsolidated material that comprised the yardang. Based upon the uniform morphology and apparent constant thickness of the flow along its length, the viscosity of the flow does not appear to have changed from the earliest phase of its eruption until the distal portion of the flow (Fig. 6) was reached. This distal portion of the flow bears a close similarity to the fresh flows in Cerberus Fossae that have previously been interpreted as potentially water-rich flows [4, 5], that has similar surface textures but has previously been interpreted as a lava flow. Part of HiRISE image ESP_028097_1805.

Possible Mode of Formation:

Broad Implications: The morphology of the flow raises the intriguing possibility that some of the other young flows within the Cerberus Fossae region [7, 8] may also be something other than lava flows. The smooth transition of surface texture from the "loose-texture" seen in Fig. 7 to the crenulated distal portion of the flow (Fig. 9) indicates that the flow was emplaced as a single flow. Future studies of the young flows within Cerberus Fossae should, therefore, consider alternative modes of formation for these flows and the implications that a different origin might have for the recent geologic history of Mars, particularly the inference that young fluvial channels were subsequently buried by lava flows [6].

Possible Mode of Formation:

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