



## **Distribution and sub-classification of glacier-like forms in Mars' mid latitudes**

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Viscous flow features (VFFs) located in the mid-latitudes of Mars show evidence of ice-related down-slope movement and are believed to be relics of a geologically-recent Martian ice age. However, the physical mechanisms responsible for the formation of these ice masses and the ways in which they have subsequently altered the Martian landscape remain unclear. These issues have been complicated recently by the identification of 'glacier-like forms' (GLFs); a sub-class of VFF containing some examples that appear to show evidence of polythermal or limited 'warm-based' glacial activity, something previously considered unlikely or impossible in the Martian environment. We have carried out a detailed survey of Mars' mid-latitudes, including over 6300 wide-angle images from the Context (CTX) camera mounted on the Mars Reconnaissance Orbiter (MRO). The resulting data indicate that GLFs occur in highly clustered populations within the mid-latitude regions of both of Mars' hemispheres. These populations are established predominantly at relatively high altitudes and most frequently also in areas of high relief. This distribution is reminiscent of glacier occurrence in Earth's alpine regions, suggesting that the initiation and formation of glacier-like forms on Mars may have occurred in a manner similar to that on Earth, where ice accumulates at altitude in quantities that are sufficient to exceed loss through periodic, possibly seasonal, ablation, initiating flow within a system of altitude- and climate-driven mass balance.

We also identify several morphological sub-types of GLF on the basis of observed variations in physical appearance and inferred structure. The distribution of these sub-types is also mapped, providing further insight into the relationship between local environmental factors and GLF-landscape interactions.