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Euripus Mons – Landform Evolution and Climate Constraints in Promethei Terra

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The Promethei Terra region of Mars exhibits a variety of geomorphic landforms indicative of ice-assisted creep of debris and ice, similar to features and processes found at the Martian dichotomy boundary in Deuteronilus, Protonilus and Nilosyrtis Mensae. Despite only little doubt about the fact that ice played an integral role in the formation of these features, it is still disputed if these features were formed by glacial processes, requiring precipitation of ice and snow and exhibiting glacial deformation and basal sliding, or if these landforms are a product of periglacial denudation and subject to different deformation regimes. As information about past climate conditions on Mars is sparse, the proper assessment of landform types today allows to put constraints on their environmental conditions in the past. Due to limited knowledge about the internal physical and thermal structure of these landforms, it remains impossible to unambiguously determine their origin [1]. A variety of geomorphic and model–based indicators need to be taken into account when putting constraints on their history and when trying to reconstruct their evolution.

For selected features on Mars it has been shown by SHARAD radar observations that the ice content might be relatively high [2], and that some of them might be composed of pure ice, protected from sublimation by a thin debris cover. One of such examples, Euripus Mons, is a 80 km remnant feature with an associated circumferential talus deposit that shows indicators for deformation by downslope movement, i.e. debris apron morphology. Recent modelling assuming glacial deformation helped to reconstruct some internal structural properties [3]. Despite these attempts, Euripus Mons shows clear geomorphic signatures of classical periglacial denudation which do not fit into the concept of glacial-only evolution. Denudation rates as well as ages are similar to those reported from other locations on Mars for which hyperarid climate conditions were proposed [4] and where no positive radar measurements could be acquired.

We here report on our observations supporting a periglacial mass wasting evolution and discuss results from numerical modelling applied to the settings of Euripus Mons.

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