Geophysical Research Abstracts
Vol. 16, EGU2014-16646, 2014
EGU General Assembly 2014

Possible slow periglacial mass wasting at the Southern Hemisphere on Mars.

Andreas Johnsson (1), Dennis Reiss (2), Ernst Hauber (3), and Harald Hiesinger (2)

(1) Department of Earth Sciences, University of Gothenburg, Göteborg, Sweden, (2) Institut für Planetologie, Westfälische-Wilhelms Universität, Münster, Germany, (3) Institut für Planetenforschung, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Berlin, Germany

Small-scale lobate landforms which are strikingly similar to terrestrial solifluction lobes are cataloged at the Southern Hemisphere on Mars. Terrestrial periglacial solifluction lobes are formed by frost creep, a combination of repeated frost heave and thaw consolidation, and gelifluction (visco-plastic deformation of near saturated soil) in the active layer on top of the permafrost table (e.g., Matsuoka, 2001). All publically available HiRISE images between latitudes 40°S and 80°S on Mars are being used in this study. Compared to previous studies of small-scale lobes in the northern mid and high latitudes (e.g., Gallagher et al., 2011; Johnsson et al., 2012; Barrett et al., 2013), these landforms also occur, in most cases, in close spatial proximity to fluvial gullies and polygonal terrain. This study aims to investigate whether the southern small-scale lobes differ from the northern counterparts in terms of morphology and distribution. Furthermore, spatio-temporal relationships to landforms with ground-ice affinity, such as gullies and polygonal terrain, are investigated.

Solifluction-like small-scale lobes have been studied in detail at the northern hemisphere on Mars (Gallagher et al., 2011), where they are widely distributed at high latitudes between 59°N and 80°N (Johnsson et al., 2012). Small-scale lobes are proposed to represent freeze-thaw activity late in Martian climate history (Gallagher et al., 2011; Balme and Gallagher, 2011; Johnsson et al, 2012; Balme et al., 2013). Small-scale lobes differ from permafrost creep (i.e. rock glaciers) in having low fronts, decimeters to less than <5 m meters in height. They also lack compression ridges and furrows and are not confined to topographic niches (i.e. valley confinement). The presence of small-scale lobes raises the question whether they have formed by a warmer-than-thought-climate, or by the influence of soil salts (i.e. perchlorates) under sub-freezing conditions (e.g., Gallagher et al., 2011).

Preliminary results indicate that the small-scale lobes are distributed more equatorward than in the north. Morphometry and morphology suggest that they are distinct from permafrost creep. Even though the southern hemisphere have more impact crater slopes fewer lobes have been observed so far in this study. The project is on-going and more work is required to firmly establish their distribution and their association to gullies and polygonal terrain. Though landforms indicative of freeze-thaw activity may be rare on flat terrain on Mars, there is growing evidence that freeze-thaw conditions may have been met on mid and high latitude slopes in recent climate history on Mars.

References: Matsuoka, 2001. Earth Sci. Rev. Gallagher et al., 2011. Icarus 211, Balme and Gallagher, 2011. GSL. Johnsson et al., 2012. Icarus 218, Balme et al., 2013. Prog. Phys. Geogr. 1-36. Barrett et al., 2013. EPSC2013-159.