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The latitudinal distribution of putative periglacial sites on the northern martian plains.

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Periglacial landscapes are found in cold regions of Earth where the freezing and thawing of the permafrost active layer plays an important role in shaping the landscape. A variety of distinctive landforms such as sorted circles, thermokarst depressions and solifluction lobes are indicative of periglacial environments on Earth. It has been suggested that similar features on the northern plains of Mars could be the result of the same, or similar processes (1). Since the formation of a periglacial landscape requires the freezing and thawing of water their presence on Mars would indicate that the thawing of water-ice has occurred in the geologically recent past. Periglacial landforms could have formed in past periods of higher obliquity when the environment was more conducive to the action of liquid water or due to the depression of the freezing point by brines under current conditions.

We have conducted a survey of putative periglacial landforms across the northern Martian plains. Over 400 HiRISE images of the walls and floors of >1 km diameter craters have been examined to map the locations of these landforms across regions of Acidalia, Utopia and Arcadia Planitia between 30 and 80 Degrees North. These data allow an assessment of the latitudinal distribution of these features. Variations between the types of landform found in different regions of the Northern Plains of mars can also be assessed.

Scalloped depressions and gullies have a similar latitude range, and are frequently found south of 60 Degrees North. There are a large number of scalloped depressions in Utopia as noted by other studies (2), similar features are found in both Acidalia and Arcadia but are not found over as wide a range of latitudes in Acidalia. Possible sorted landforms (lobes, polygons etc) can be found as far south as 40 and as far north as 70 Degrees North but most are found between 45-65 Degrees North. They seem to occur over a wider range of latitudes in Utopia Planitia than in Acidalia.

References

1)Gallagher, C. J., & Balme, M. R. (2011). Landforms indicative of ground-ice thaw in the northern high latitudes of Mars. Geological Society, London, Special Publications, 356(1), 87–110.
2)Séjourné, a., Costard, F., Gargani, J., Soare, R. J., Fedorov, a., & Marmo, C. (2011). Scalloped depressions and small-sized polygons in western Utopia Planitia, Mars: A new formation hypothesis. Planetary and Space Science, 59(5-6), 412–422.