PERIGLACIAL PROCESSES IN THE SOUTHERN HEMISPHERE OF MARS. E. L. Langsdorf[1] and D.T. Britt[2], [1]Dept. of Physics, University of Central Florida, P.O. Box 162385, Orlando, FL 32816-2385, elangsdorf@cfl.rr.com, [2]Dept. of Physics, University of Central Florida, P.O. Box 162385, Orlando, FL 32816-2385, britt@physics.ucf.edu.

Introduction: On Earth a range of periglacial processes and morphologies are indicative of moisture-soil interactions in arctic terrain. [1]. Strikingly similar morphologies on Mars, at similar physical scales, have been identified in high resolution images taken by the Mars Orbital Camera (MOC) [2, 3]. Previously, polygons identified in MOC images have been mapped globally in both the southern and northern polar regions of Mars. [4]. The polygons were found in the range of 40° N – 90° N and likewise from –40° S to –90° S [4]. Different types of polygons were found: small scale, large scale polygonal nets on level terrain, and large scale polygonal nets in craters. These polygons are thought to be caused from frost cracking, as opposed to any other processes that cause terrestrial polygonal features [4].

The focus of our research is to systematically identify and map periglacial features in the southern polar regions of Mars. Identified features are mapped on Mars polar base map with a topographical overlay. This allows us to locate groups of polygons, establish their spatial relationships, and characterize any elevation controls on polygon formation. This will help us to understand the range of occurrence of periglaical morphologies and any physical controls on the development of these morphologies.

Method: High resolution MOC images are a treasure trove of detail on the small-scale morphology of the Martian surface. Images with pixel resolutions of better than six meters were used to examine the Martian polar regions and to identify periglacial features. In this abstract we focus on reporting our identification of large-scale non-sorted polygons in the southern polar terrain. Polygonal features for this investigation were defined as a group of polygonal-shaped liniments on the scale of 10's to 100's of meters that are repeated at the same scale. Only those images in which polygons were easily identified were mapped. An example is shown in Figure 1. We focused on the latitude ranges likely to have periglacial features; -60° S to -85° S. We are reporting on the first stage of this investigation, covering the southern polar terrain over the longitude range of 0^o – 180°.

Observations: Of the 2104 MOC images analyzed, 312 displayed polygon features and the locations of these features are mapped in Figure 2. When mapped on a topographical map of Mars' southern polar region, patterned ground tended to group around elevated terrain. In particular, in the region of Planum Angustum (latitude -78°S - -82°S, longitude 60° - 90°) there was an increased amount of patterned ground associated with increased elevation. From the longitude range 1° – 90° there were 237 images of patterned ground, while there were only 75 images for the longitude ranges 90° – 180°. It is interesting to note that pingos and dark dune spots appeared frequently next to patterned ground. It has been thought that some liquid phase plays a key role in the development of dark dune spots [5]. This suggests the patterned ground, dark dune spots, and the pingos are all part of a local enrichment in soil moisture that drives the formation of these features in the periglacial environment.

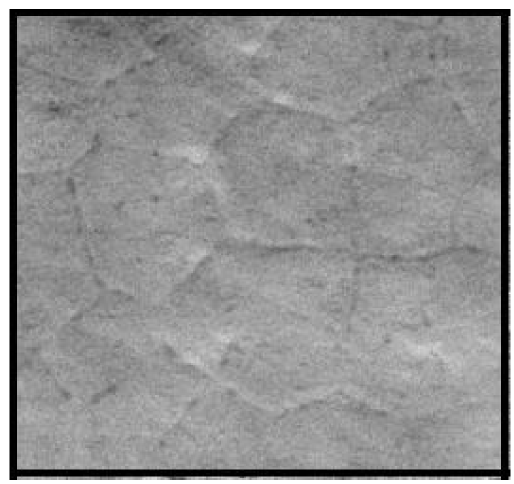

Figure 1: Polygonal terrain in the Martian south polar regions. Image is about 1.5 kilometers across. From MOC image M0806617

Conclusions: The formation of patterned ground appears to be controlled, in part, by the elevation of the terrain. As we continue this research and map the other half of the southern polar region we will get a better idea of the role that topography plays in the development of patterned ground.

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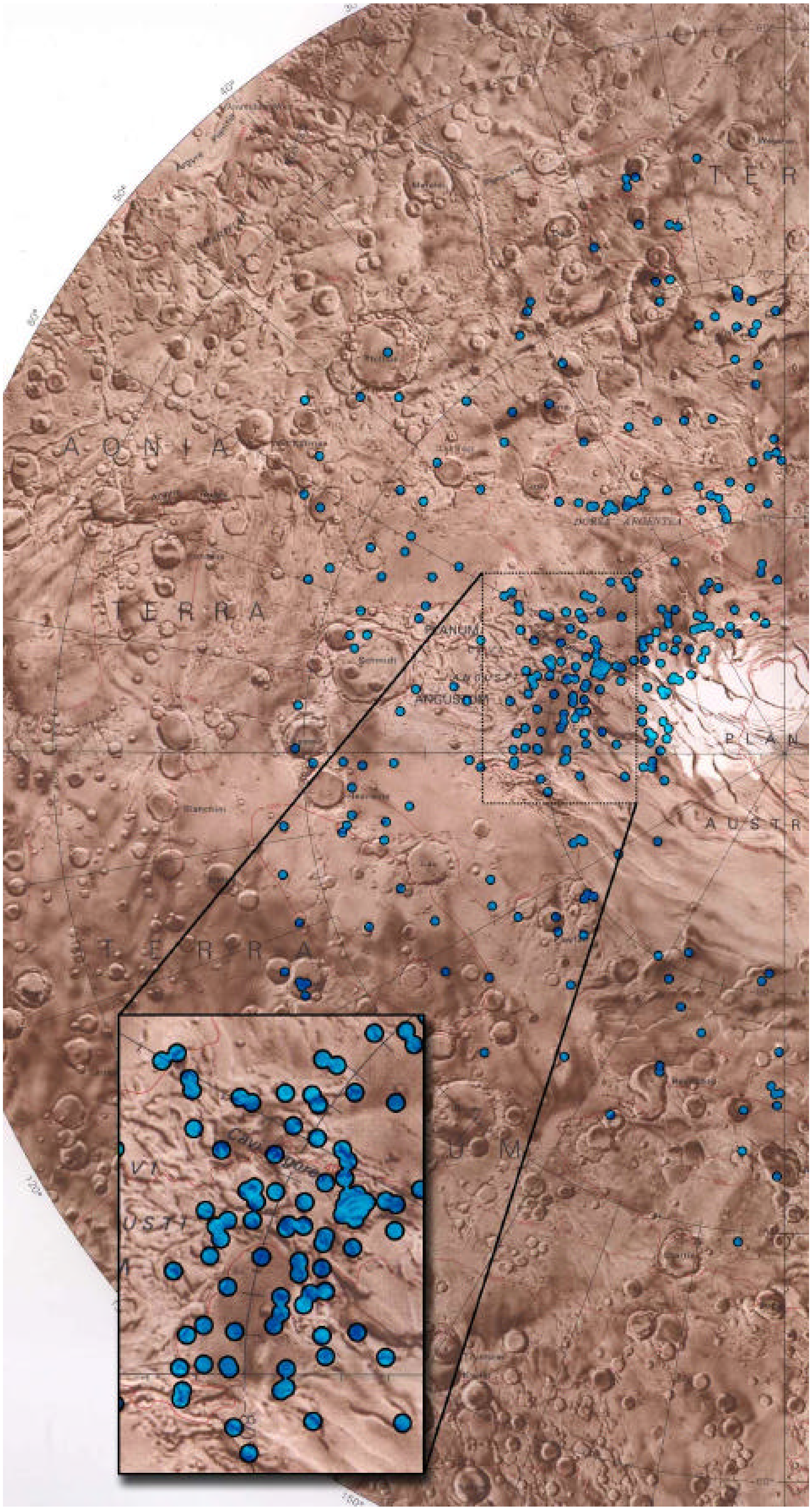

2: Map of the location of south polar region polygon features