



Renewal of Polygonal Thermal Contraction Patterns at the South Pole, Mars

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As part of our mapping work focused on Martian south polar polygonal patterns, we have taken special interest in areas that have been imaged two or more times by the Mars Orbiter Camera (MOC) instrument in order to identify seasonal variations. We present multi-temporal observations of variations in polygonal patterns. The region of interest covers a south polar trough (SPT) that is incised into the south polar residual cap (SPRC), exposing underlying dark-lane deposits. The diameters of the individual polygons range from 10 meters to about 140 meters. The scenes in both years show an almost identical relative frequency of 3-ray and 4-ray conjunctions in the image data. The conjunction angles between individual polygonal troughs range from 80° to 140° with two maxima at 90° to 100° and at about 120° . The sequence of layers in the SPT is characterised by at least three units. The top layer is a seasonal CO_2 -frost layer that is present in the spring, but also appears to exist in the fall and winter. The (cracked) middle unit becomes exposed at the latest by early summer and vanishes by mid-summer. On this layer polygonal fractures are visible. The bottom unit consists of dark-lane material of the trough deposits. The observations yield the following conclusions: 1. Geologic processes are active on Mars which suggests that the south polar cap must be considered as an individual geologically active unit. 2. We found strong indications that a layer of different composition (possibly H_2O) underlies the seasonal CO_2 frost cover. This layer cracks due to thermal contraction and sublimates during summer. 3. At this SPT, due to the instability of the surface, ice-wedging can be ruled out. 4. Based upon three-years of observation, polygonal patterns change annually in regions where conditions are favourable. 5. In this context, climatic change plays no role in the evolution of polygonal cracks.