SPRING AND SUMMER CHANGES AT THE SOUTH POLE AS SEEN BY THE MARS ORBITER CAMERA. A.P. Ingersoll[1], B.C. Murray[1], S. Byrne[1], E. De Jong[2], G.E. Danielson[2], K.E. Herkenhoff[3], H.H. Kieffer[3] and L.A. Soderblom[3]. [1]Division of Geological and Planetary Sciences, Caltech, 1200 E. California Blvd., Pasadena, CA 91125, US. [2]Jet Propulsion Laboratory, [3]United States Geologic Survey. Correspondence Email: api@gps.caltech.edu

Introduction: The Mars Orbiter Camera (MOC) on the Mars Global Surveyor (MGS) spacecraft has been able to follow individual features as the CO_2 frost disappears and exposes the material underneath. Because the orbit of MGS is inclined at an angle of 93 degrees relative to the equator, the spacecraft gets especially good coverage of the ring at 87 degrees latitude. The following is a list of phenomena that have been seen during the spring and summer at the South Pole.

(1) Circular depressions, described by Thomas et al. [1], which are ~ 10 meters deep and 100's of meters in diameter. They are found only within the residual polar cap, the part that survives the summer. The high areas between the depressions are flat-topped mesas whose sides are concave circular arcs. In some places the depressions form patterns that exhibit north-south symmetry, suggesting some control by sunlight.

(2) Dark layers that are exposed on the walls of the mesas. Each layer is at most a few meters thick. The dark layers might accumulate during climatic episodes of high atmospheric dust content, or they might accumulate during the annual cycling of dusty CO_2.

(3) Albedo differences that develop during the summer within the residual cap. These include subtle darkening of the floors of the depressions relative to the mesas and occasional major darkening of the floors, especially near the edge of the cap. The floors and mesas form a distinct stratum, suggesting they represent a distinct compositional boundary. For instance the floors may be water and the mesas may be CO_2.

(4) Small dark features that appear in spring on the seasonal frost outside the residual cap. Some of the features have parallel tails that are clearly shaped by the wind. Others are more symmetric, like dark snowflakes, with multiple branching arms. After the CO_2 frost has disappeared the arms are seen as troughs and the centers as topographic lows.

(5) Polygons whose sides are dark troughs. Those that are outside the residual cap seem to disappear when the frost disappears. The polygons and the dark snowflake-like structures may be related, and suggest that CO_2 frost may form cohesive slabs as described by Kieffer et al. [2].

(6) Irregular depressions outside the residual cap. They look like degraded versions of the circular depressions inside the residual cap, and may be a remnant of the cap's changing location.

(7) Areas of burial and exhumation of circular depressions. Thomas et al. give an example with a sharp boundary: On one side the depressions are buried and on the other side they are exposed. In other cases there are rounded troughs up to 1 kilometer wide, which are dark in summer and appear to have eroded down below the floor of the circular depressions.

References: [1] Thomas P.C. et al., (2000), Nature, 404, 161-164. [2] Kieffer H.H. et al., (2000), J. Geophys. Res., in press.