THE CANTELOUPE TERRAIN OF TRITON, Joseph M. Boyce, Solar System Exploration Division, Office of Space Science and Applications, National Aeronautics and Space Administration, Washington D.C. 20546

Voyager passed within 39,800 km of Triton during its encounter with Neptune in August of 1989. Images of the surface Triton suggest considerable geologic activity, including numerous features that appear to be volcanic and tectonic. Of the terrains imaged at high resolution, the canteloupe terrain is the most enigmatic. Smith et. al. (1989) has observed that this terrain dominates the western equatorial region and consists of a dense concentration of pits or dimples. The dimples appear to be bimodal in size. The modes are at about 5 and 25 km diameter. The small dimples are found dominantly in the western part of the terrain. The dimples are often organized into linear equally spaced sets. Some have central peaks or mounds. No obvious volcanic flow features are observed, such as flow fronts or blanketing deposits. At the highest resolution the canteloupe terrain is extremely rough and textured which probably explains why few small fresh impact craters have been unambigously identified there. However in areas imaged at low sun angles numerous small irregular depressions occur that have the shape of secondary craters.

In places, small individual arcuate ridges are found in the canteloupe terrain, which may be the remnants of old degraded impact craters. They are truncated by the dimples and are a different size. Some of these structures are large and extremely subdued and may be palimsests similar to those found on other icy satelites (where viscous relaxation has affected the morphology of large craters). The size of these large craters suggests that they formed early in the history of the solar system (about 4 G.Y. ago).

The terrain is crisscrossed by prominent ridges with grabens at their crests. Commonly a low medial ridge(s) is found within the graben. These interior ridges appear to be composed of viscous material extruded along the faults of the graben. This ridge/graben system is global, extending across all observed terrains with the exception of some of the younger plains deposts that have buried parts of some ridges.

Cut by the ridge/graben system are subdued, closely spaced, concentric sets of arcuate ridges and troughs that crisscross only the canteloupe terrain. Individual sets of these features are reminiscent of wave trains and may be responsible for giving the cantaloupe terrain its unique morphology. Where the sets cross, interference patterns are produced that result in regularly spaced dimples. The dimples appear to rougher at finer scales and more textured toward the northeast part of the terrain where extensive young volcanic activity has occured. This change in morphology may be the result of the effects of a change in subsurface thermal conditions (increased temperature to the northwest) in that direction.

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There appears to have been no lateral movement along these old features. In places, these subdued ridge and trough sets parallel arcuate segments of the ridge/graben system. All observed sets of these subdued ridges and troughs appear to be geometrically small circles and in some places form nearly complete circles.

Smith, et. al., has suggested that some combination of viscous flow, collapse and deteriorization of landforms by extensive sublimation may have been responsible for the morphology of the canteloupe terrain. However, these observations suggest that the unique morphology of the canteloupe terrain may be, to a first approximation, the result of two superimposed ridge/trough systems, giving the appearance of an interference pattern. The individual elements of this pattern may have been also modified by the processes suggested by Smith, et. al. The ridges and troughs features could have been produced early in Triton's history by formation of large multiple-ring impact basins such as those observed on Ganymede and Callisto (e.g. Valhalla). Alternatively, these features could be faults or folds formed by stresses generated during circularization of Tritons orbit or by internally driven tectonic events.

REFERENCE CITED

Smith, B. et. al. (1989) Science 246, 1422-1449.