GEOLOGIC MAPPING OF TRITON'S NEPTUNIAN HEMISPHERE. E. S. Martin[1], D. A. Patthoff[2], M. T. Bland[3], T. R. Watters[1], G. C. Collins[4], T. Becker[5], [1] Smithsonian Institution, National Air and Space Museum, Center for Earth and Planetary Studies (martines@si.edu), [2]Planetary Science Institute (appatthoff@psi.edu), [3]U. S. Geological Survey, Flagstaff, AZ, [4]Wheaton College, Norton, MA, [5]University of Arizona, Tuscon, AZ.

Introduction: Neptune's moon Triton (Fig. 1) was revealed in 1989 by the Voyager 2 encounter. Triton was discovered to be a geologically active moon [1], and its young surface has been linked to its dynamical history as a captured Kuiper Belt Object (KBO) [e.g., 2] and a possible subsurface ocean.

Triton is a unique world that bridges a gap between KBOs and icy satellites of the well-characterized gas giants. This moon also provides a unique insight to the satellite system histories of ice giant systems. As a likely KBO captured into Neptune's orbit [e.g., 2] Triton contributes to the diverse population of icy satellites, but its origin is unique relative to those of the icy satellites (Fig. 1) [3].

The capture of Triton by Neptune likely resulted in a massive heating event that resulted in resurfacing [4, 5], possibly by cryovolcanism [6, 7]. Crater counts for both Triton [8] and portions of Pluto [9] suggest that both surfaces are exceptionally young, which may indicate that neither Triton nor Pluto retain their original surfaces.

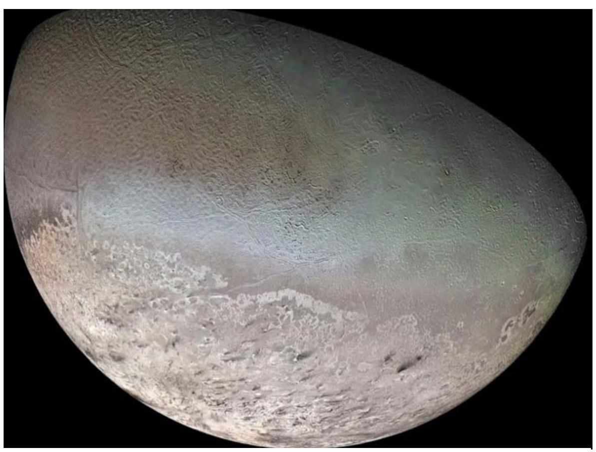

Figure 1: Orthographic projection of Triton's Neptune-facing hemisphere. Image No PIA00317

Mapping of Pluto and Charon is in progress [10, 11, 12], but as no comparable geologic map of Triton exists, a direct comparison among these KBOs therefore cannot be performed at a fundamental level. Furthermore, since Triton serves as a conceptual bridge between KBOs and icy satellites, characterization of Triton's terrains is important for advancing comparative planetological studies. To-date, no peer-reviewed, broad-scale, detailed geologic map of Triton exists to characterize, classify, and identify geologic surface units and features on Triton.

Previous geologic mapping efforts of Triton (Fig. 2) did not include a Scientific Investigations Map (SIM) by the U. S. Geological Survey (USGS), nor is it available in a digital format for distribution and use by the community. It is necessary for an accessible, digitized, USGS SIM be created to firmly establish the geology of Triton's surface.

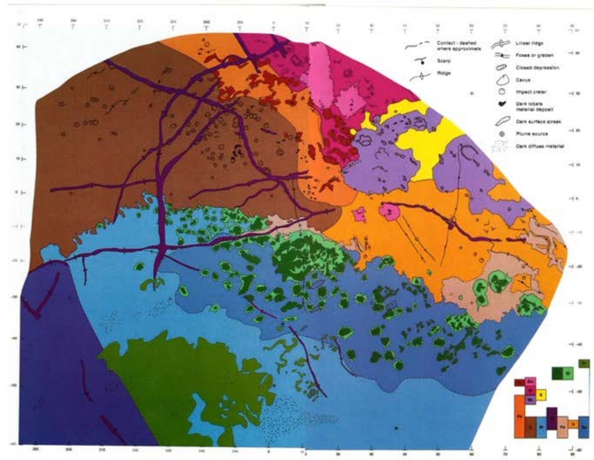

Figure 2: Geologic map of Triton from [13].

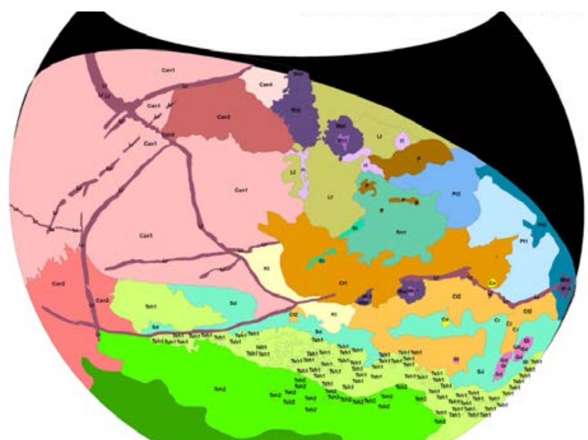

Figure 3: Triton geological units and surface features to date.

Mapping Triton's Geology: Understanding Triton's geologic history is essential to unraveling its origin and evolution. Our mapping of Triton is using the USGS Voyager 2 orthographic color mosaic with a resolution of 600 m/pixel (Fig. 1). This mosaic covers the area of Triton that faces Neptune and covers approximately 1/3 of Triton's surface from 45° to -60°N latitude and -75° to 90°E longitude.

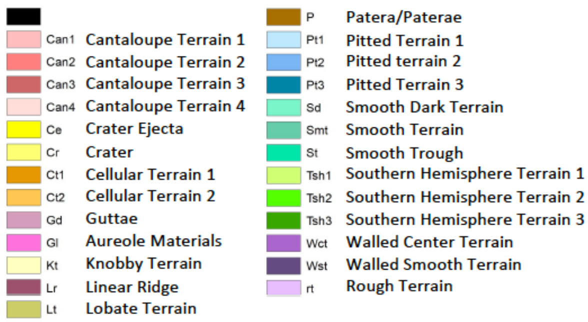

Figure 4: Notional names for geologic units, including legacy (not IAU) terminologies.

Terrain units are identified based on unit morphology, and in some cases, subgroups were identified. For example, Cantaloupe terrains cover almost 1/3 of the imaged surface, but display four different morphologies.

Terrain units were named based on their morphology, using legacy terminologies (like Cantaloupe) where appropriate. However some legacy names (like Guttae) are not IAU recognized feature types. Additionally, some of the currently identified terrains, like the southern hemisphere terrains, are not a morphologically derived title.

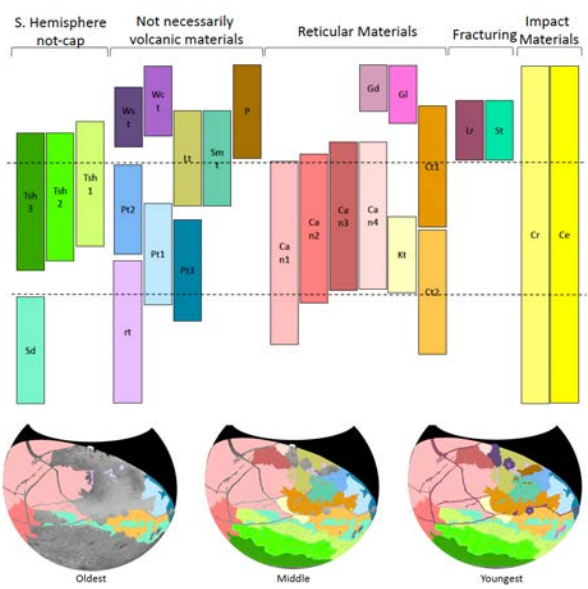

Figure 5: Notional correlation of map units highlighting three periods of activity on Triton.

Preliminary results of mapping show that ~70% of terrain units occur in the middle and most recent time periods. This suggests that there is a heterogeneous distribution of geological processes occurring contemporaneously. We also find that ridges are the most recent landforms, but do not directly cross-cut the (not necessarily) volcanic terrains suggesting that their relative age relationships require additional scrutiny.

Here we will present our latest up-to-date mapping results for community input.

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