**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[3], [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, [4]Wheaton College.

**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 ocean world.

Triton is a unique world that bridges a gap between KBOs and icy satellites as well as member of an ice giant system rather than the more well characterized gas 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.

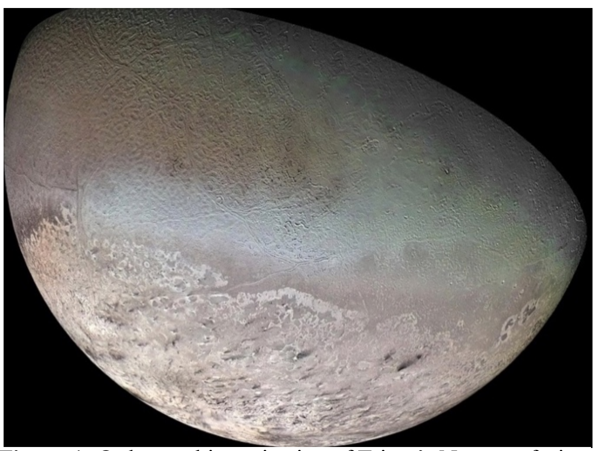

**Figure 1:** Orthographic projection of Triton's Neptune-facing hemisphere. Image No PIA00317

Mapping of Pluto and Charon is in progress [10, 11, 12], but as no comparable geologic map of Triton exists, a direct comparison between these KBOs cannot be performed at a fundamental level. Furthermore, as Triton serves as a bridge between KBOs and icy satellites, characterization of its 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 on 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.

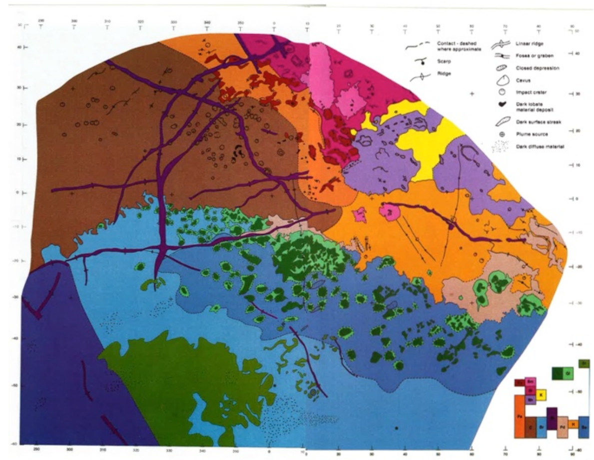

**Figure 2:** Geologic map of Triton from [13].

**Mapping Triton's Geology:** Understanding Triton's geologic history is essential to unraveling its origin and evolution. Geological mapping of Triton will allow for identification of geologic units and structures that are recently formed, and those that are ancient, revealing more about Triton's evolution. Our mapping of Triton is supported by existing maps of Triton [e.g., 13].

Mapping will occur on the USGS Voyager 2 orthographic color mosaic with a resolution of 600 m/pixel (Fig. 1), however for the purposes of mapping the color will be removed from the gray-scale color mosaic. This mosaic covers approximately 1/3 of Triton's surface from 45° to -60°N latitude and -75° to 90°E longitude. This map will provide a framework for future Triton research, future KBO research, and preparation for future missions.

We will present in-progress mapping results of the Neptune-facing side of Triton at a scale of 1:5,000,000 (Fig. 3). Included in the map will plume localities previously identified [14] that will be adjusted to the new control network (Fig. 4).

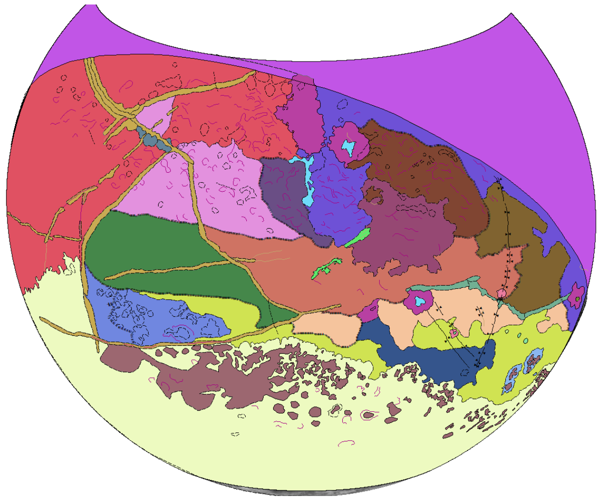

**Figure 3:** Preliminary mapping results of Triton's Neptunian hemisphere, including tectonic structures.

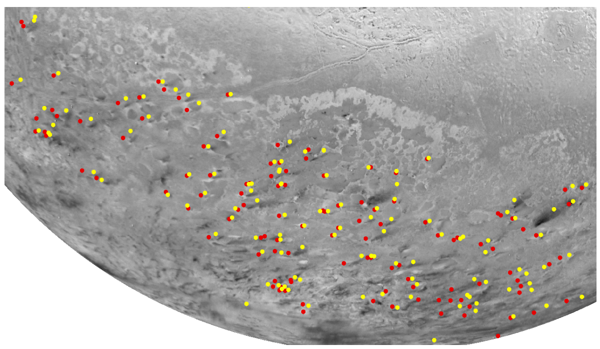

**Figure 4:** Plume localities identified by [14]. Red points indicate the start of the plume and yellow points identify the end of the plume. Background mosaic is the updated basemap used for mapping.

**Data Restoration & Archiving:** Our digital Triton data archive is in progress. There are 44 images of Triton from Voyager 2 with resolutions better than 2 km/pixel (338-1.6 km/pixel). Individual images have been restored and improved by removing line-drops, reseaux marks and corner marks [15].

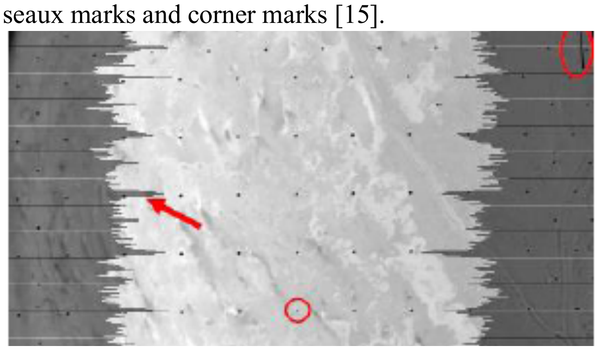

**Figure 5:** Illustration of line-drops, reseaux marks, and corner marks on an unrestored Voyager 2 Triton image [15].

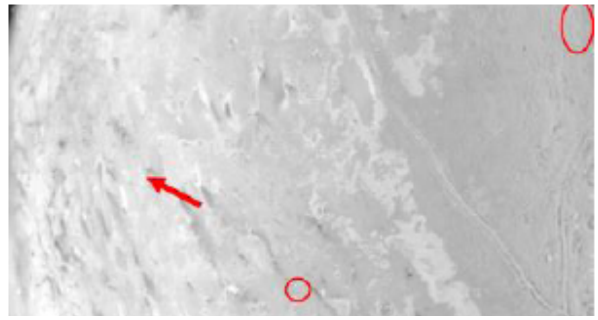

**Figure 6:** Final image after line-drops, reseaux marks, and corner marks have been restored [15].

A new orthographic mosaic was produced using the restored images (e.g. Fig. 5) and has served as the basemap for the mapping effort (Fig. 3). Individual restored images and the new Triton mosaic are in the process of being archived for use by the community.

We will present our latest up-to-date mapping results for community input. We will also report on progress of the archiving effort of restored data and the updated basemap to enhance and support community efforts to explore the ice giant systems [16, 17].

**References:** [1] Smith B. A. et al. (1989) Science 246, 1422-1449. [2] Mckinnon W. B. et al. (1995) *Neptune and Triton,* ed. Cruikshank. P807-877. [3] Schenk P. M. and Jackson P. A. (1993) *Geology,* 21, 299-302. [4] McKinnon W. B. (1984) *Nature* 311, 355-358. [5] Mckinnon W. B. (1992) *EOS* 73, 190. [6] Croft S. K. (1990) *XXI LPSC,* 246-247. [7] Schenk P. M. (1992) *XXIII LPSC,* 1215-1216. [8] Schenk P. M. and Zahnle, K. (2007) *Icarus,* 192, 135-149. [9] Stern, A. S. et al. (2015) *Science* 246, 1422-1449. [10] Moore J. M et al. (2016) *Science* 351, 1284-1293. [11] Robbins, S. J. et al. (2016) *Geologic Mappers Meeting* #7026. [12] White, O. L. (2016) *Geologic Mappers Meeting* #7001. [13] Croft S. K (1995) *Neptune and Triton* ed. Cruikshank, 879-947. [14] Hansen et al. (1990), *Science,* 250, 421-424. [15] Bland et al. (2019) *Planetary Data Workshop,* Abs. No. 7055. [16] Prockter L. M. et al (2019), $50^{th}$ LPSC, Abs. No 3188. [17] Mitchell, K. L et al. (2019), $50^{th}$ LPSC, Abs. No 3210.