

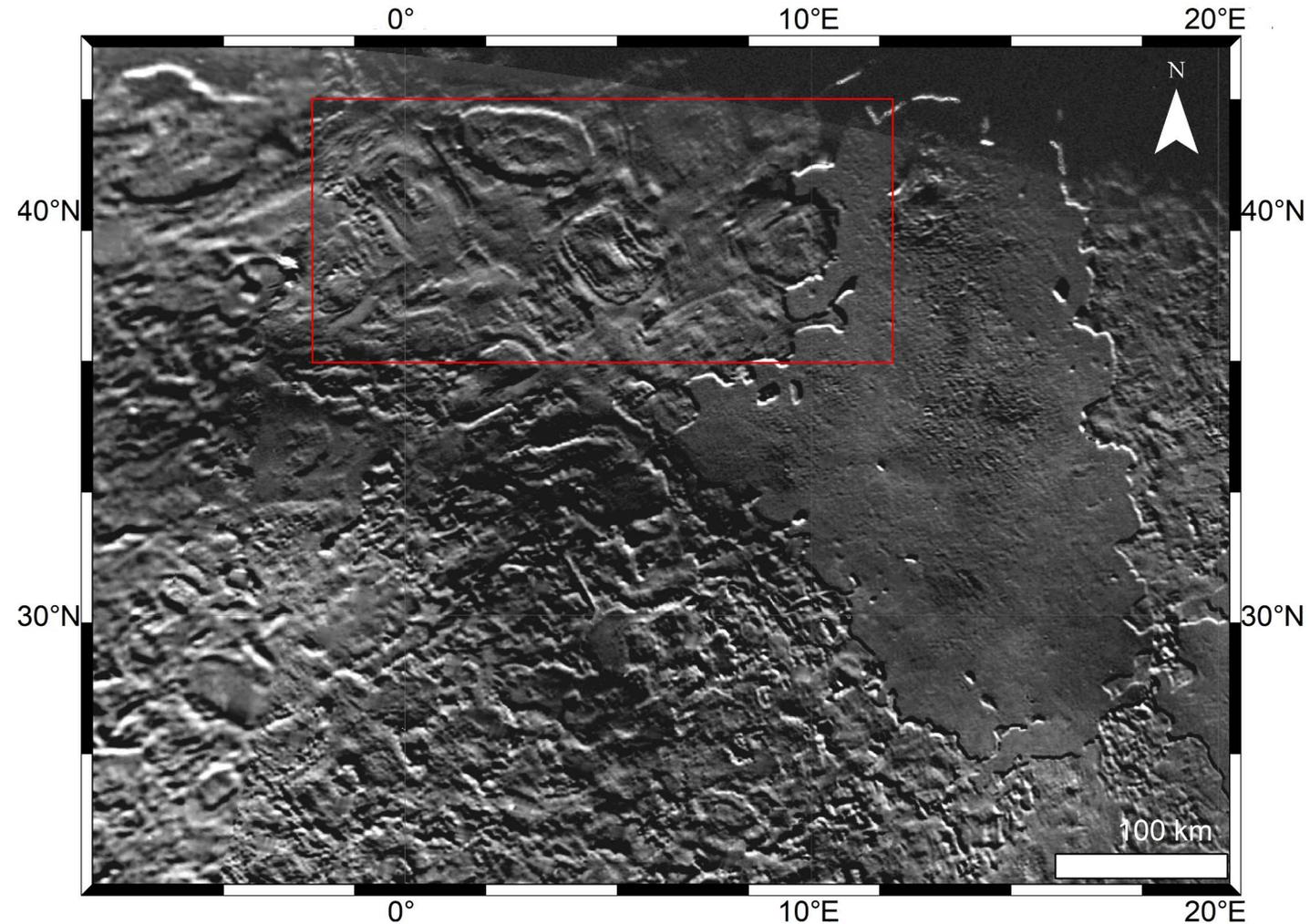
Geomorphological analysis with digital elevation model of Monad Regio, Triton

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Triton is a unique world for its ongoing geological activity, proved by the few craters detected (*Schenk & Zahnle, 2007*), the young surface, and for the enigmatic cantaloupe terrain, not observed elsewhere in the Solar System.

This work analyses an area at NW of Tuonela Planitia, where some-sharply rimmed- depressions are located. Their origin is still controversial: diapirism (*McKinnon & Kirk, 2014*), cryovolcanism, and impact cratering (*Martin-Herrero et al., 2014*) hypothesis have been proposed.





We produced a geological map of the study area, a novel DEM (Digital Elevation Model), and cross-section plots of the basins.

1. Production of a geological map

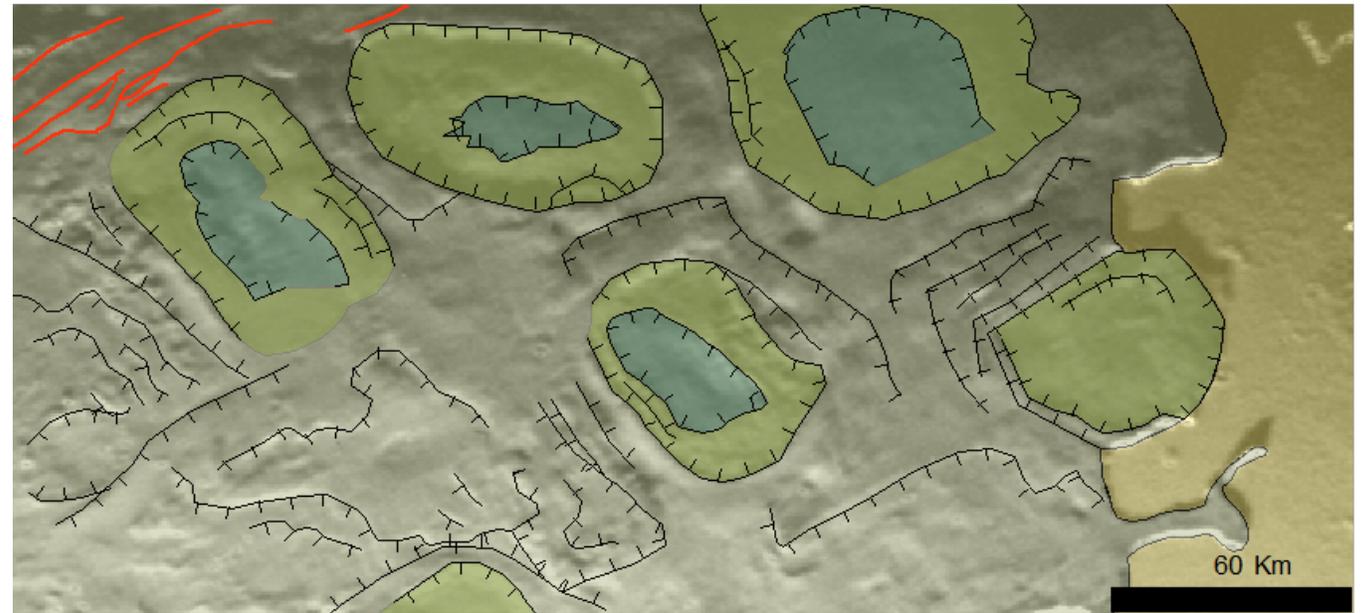
- Calibration, filtering, and georeferencing of Voyager 2 imagery named c1139533 (Smith et al., 1989), with a resolution of 600m/pixel by using ISIS (Integrated Software for Imagers and Spectrometers) (*Houck & De Nicola, 2000*).
- Mapping of the different geological features.

2. Production of the digital elevation model

- Application of the open-source suite of tools NASA ASP (Ames Stereo Pipeline) (*Beyer, R. A. et al., 2018*), using photoclinometry-based Sfs (shape-from-shading) tool (*Lesage et al., 2021*).
- Production of topographic cross - section plots.

Geological map

- Terraced terrain (*tt*) passes abruptly to smooth plains (*sp*).
- Smooth plains (*sp*) are the flattest areas on Triton.
- Basins (1300-2050 km²) where two units are recognizable: **inner (*ib*)** and **outer basin (*ob*)**. They show a different degree of alteration.
- Tectonic lineations, probably associated with a wide ridge lying outside the study area.



Legend

Geological units

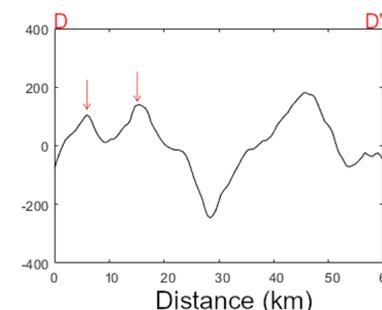
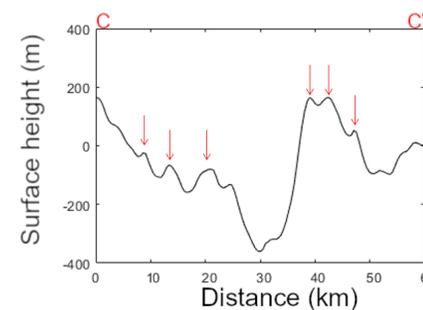
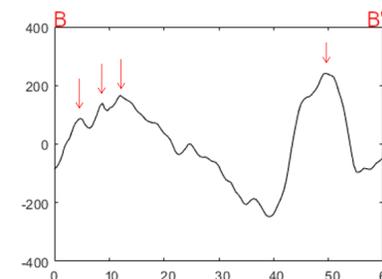
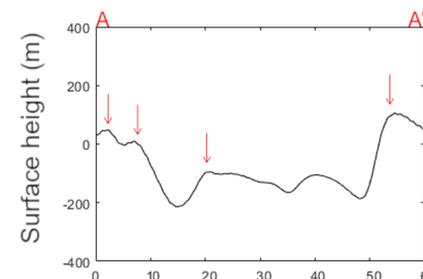
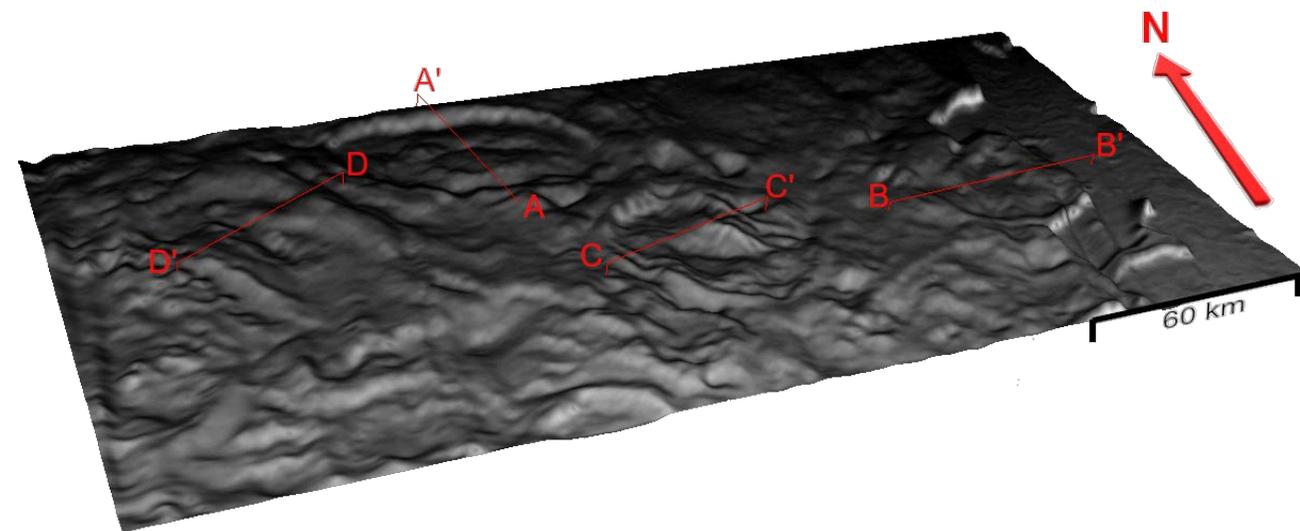
- Terraced terrain (*tt*)
- Smooth plains (*sp*)
- Outer basin (*ob*)
- Inner basin (*ib*)

Linear features

- Tectonic lineation
- Terrace

Digital Elevation Model

- The terraced terrain hosts several large basins, with areas ranging from 1300 to 2050 km². The depth range of these features is from 300 to 500 m.
- Several terraces have been spotted, some of which lay in a parallel arrangement around some of the basins. By using the Digital Elevation Model, we recognized two different trends in the progressive elevation of the terraces (see cross-section plots).





We produced a new geological map of Monad Regio, Triton, focusing on its peculiar terraced morphologies.

The production of a Digital Elevation Model (DEM) allowed us to extrapolate cross-section plots across the main depressions. These features show relatively homogeneous sizes and excavation depths, excluding an impact-related origin.

Therefore, we argue an origin similar to terrestrial maar craters (*Lorenz, V., 2003*), or explosive craters on Titan (*Mitri et al., 2019*). Diapirism may also explain the nature of these basins.

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