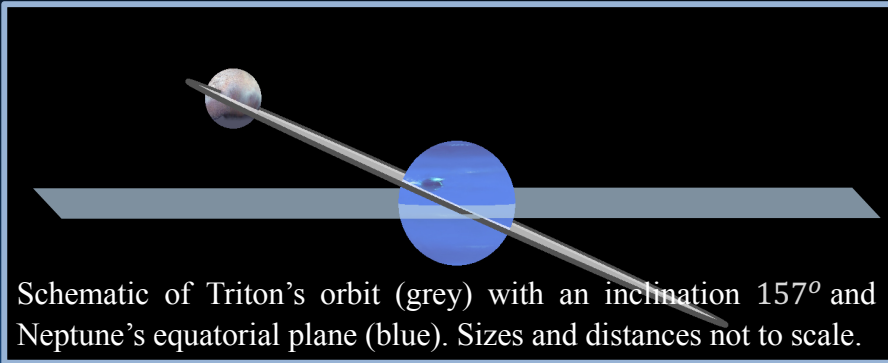


Triton's Capture Transformed a Pre-existing Neptunian Satellite System



A better understanding of how Neptune's peculiar satellite system, with the largest satellite, Triton, in a highly inclined orbit came to be captured and evolve into the system present today is addressed through a new in-depth dynamical evolution study.

- In other giant planet systems, most large satellites are found close to the planetary equatorial plane, but Triton was probably a Pluto-like body before it was captured by Neptune's gravitational field.
- A new study started with Uranian-like pre-existing satellite system, that, after capture of Triton in a retrograde orbit, showed the other prograde satellites rapidly impacting Triton. Usually these impacts would have not been disruptive, but would dissipate energy and pull Triton into a closer and more circular orbit. Triton's orbit would continue to circularize due to tidal interactions with the planet, until it reached its current state. The rapid impact phase would increase the stability probability of outer irregular satellites (e.g. Nereid) compared to purely tidal histories.
- This modeling suggests that the mass of the probable primordial satellite system can be constrained by the mass required to remove orbital energy to decrease Triton's orbit, ensure the stability of outer satellites, and maintain Triton's high inclination.

Triton's survival on its peculiar orbit argues that Neptune had a primordial satellite system that was similar or somewhat less massive than Uranus'.

Rufu & Canup (2017) *Astron. J.*

