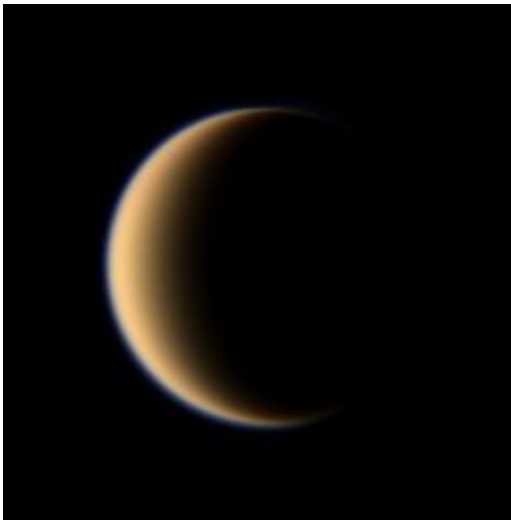


New research suggests tropical cyclones could develop on Saturn's largest moon Titan

March 21 2013, by Bob Yirka



Titan's hazy orange globe hangs before the Cassini spacecraft. Image credit NASA/JPL/Space Science Institute.

(Phys.org) —Planetary scientist Tetsuya Tokano of Germany's University of Cologne has found that the right ingredients might exist on Titan, Saturn's largest moon, for the formation of tropical cyclones. In his paper published in the journal *Icarus*, Tokano says that if one the seas on Titan contains enough methane, then all the conditions could be present for the formation of the mini-hurricanes.

Titan is Saturn's largest moon and is the only known [natural satellite](#) with a dense atmosphere. Its mass is roughly 80 percent larger than that of

Earth's moon, and because of the great distance from the sun, experiences year-round very low temperatures. And while its body is made mostly of a mix of rocks and [frozen water](#), it has an atmosphere that is mostly nitrogen with some [ethane](#) and [methane](#). Titan is also the only known moon in the solar system (besides Earth) to have liquid on its surface, and because of that, rainfall. Tokano believes Titan is capable of spawning tropical cyclones because he thinks one or more of the seas on the moon is not only large enough, but has enough methane in it to give rise to the storms—researchers can't say for sure whether this is the case or not because past observations of the moon have been obscured by the dense atmosphere, making it difficult to determine what lies below.

Tropical cyclones are spinning storms that develop on Earth when warm ocean water evaporates into the air, carrying with it enough energy to spawn spinning storms. On Earth, such storms generally develop around the [equator](#), in the tropics, hence their name. On Titan, things would be a lot different as all of the seas that could be capable of generating such storms are located near its [North Pole](#).

In studying the topology of Titan, Tokano noted that the moon has at least three seas that should be large enough to support the formation of tropical cyclones, provided there is enough methane in them. He suggests that when methane evaporates up out of a sea during its summer season, it would carry with it heat that would be converted into kinetic energy—enough to drive the formation of a swirling storm. He notes that over the next few years, Titan will be entering its summer season, providing researchers monitoring data from Cassini—the spacecraft orbiting Saturn—an opportunity to see if the distant moon is indeed experiencing any tropical cyclones.

More information: Tetsuya Tokano, Are tropical cyclones possible over Titan's polar seas? *Icarus*, Available online 8 February 2013

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Abstract

While extratropical cyclones cannot be expected in Titan's barotropic troposphere, tropical cyclones which gain their energy from the latent heat of sea evaporation cannot be entirely dismissed over Titan's polar hydrocarbon seas. The most essential condition for the genesis of tropical cyclones on Titan is a methane-rich composition of the polar seas. The most likely season for Titan's hypothetical tropical cyclones is around the northern summer solstice when the sea surface gets warmer and the relative vorticity of the near-surface air increases by seasonal convergence and equatorial wave activity. A tropical cyclone would manifest itself as an anti-clockwise swirling vortex right over one of the northern seas (Kraken Mare, Ligeia Mare, Punga Mare) and increase the surface wind over the seas by an order of magnitude. On the other hand, tropical cyclones are unlikely to emerge over Titan's few tropical lakes for dynamic reasons such as negligible Coriolis parameter and large vertical wind shear.

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