**News-Archive**

# Kraken Mare: a reflecting surface of a lake on Saturn's moon Titan

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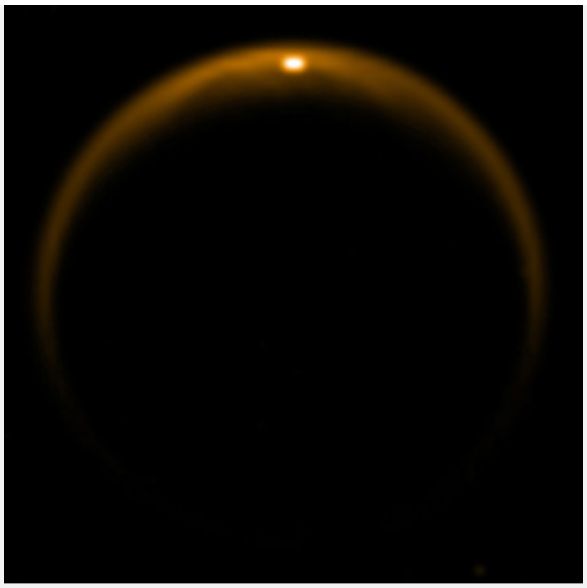


Reflection of sunlight off a lake on Titan

There are more and more signs that lakes exist on Saturn's moon Titan, filled with liquid hydrocarbons. Scientists from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have made another important discovery. With a spectrometer onboard the planetary space probe Cassini, they found glints that have their origin in reflections of the Sun's radiation from the surface of a large lake near Titan's North Pole.

"We are confident that these reflections come from a standing body of liquid," Dr Katrin Stephan and Prof Ralf Jaumann from DLR's Institute of Planetary Exploration jointly explain. The DLR scientists will present their observation at the annual conference of AGU, the American Geophysical Union, in San Francisco, tomorrow, Friday 18 December. The name of the lake observed is Kraken Mare, from a Norse saga. Covering an area of up to 400,000 square kilometres this lake is larger than the size of the Caspian Sea, the largest lake on Earth.

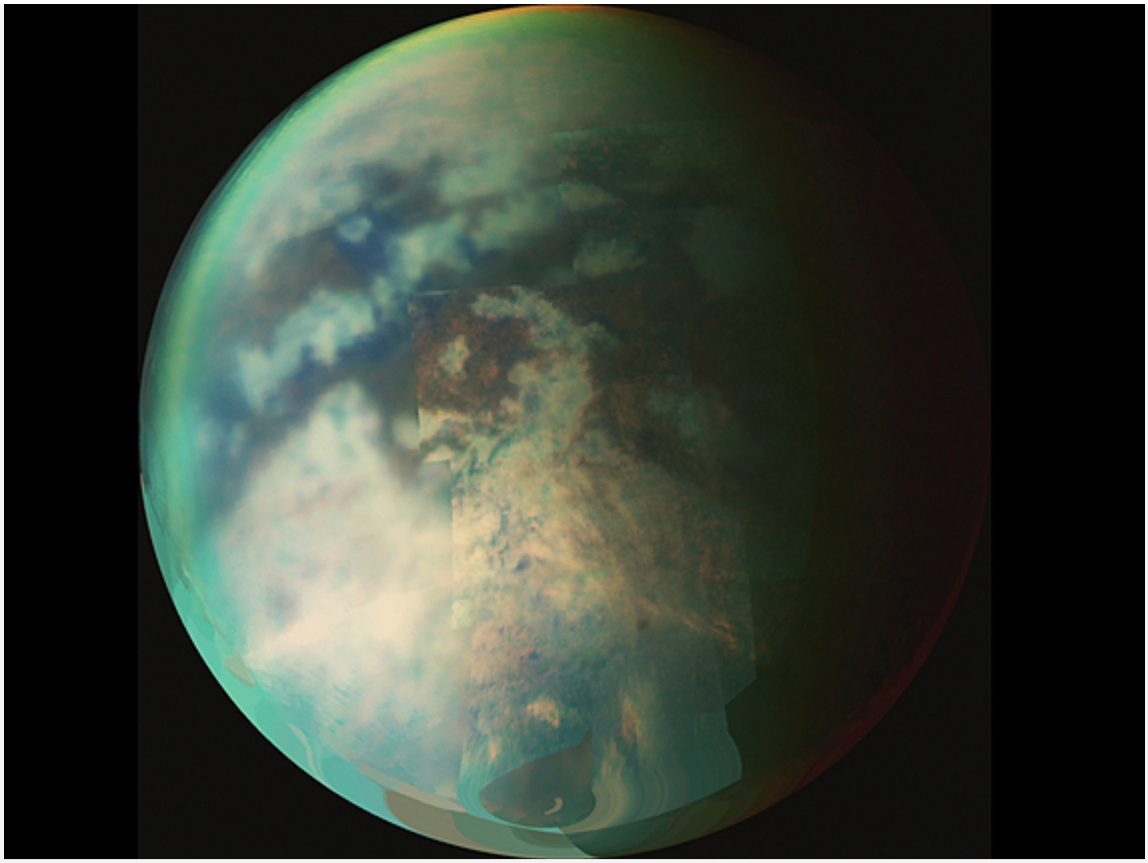
## Reflections from a mirror-like liquid surface at infrared wavelengths

During the 59th flyby of Titan on 8 July 2009, Cassini's Visual and Infrared Mapping Spectrometer (VIMS) observed a very bright, infrared glint, similar to visible glints of sunlight off Earth's bodies of liquid water, from an area in Titan's northern polar region. "We think that in nature only the surface of a liquid can appear so smooth," Dr Stephan explains. "An icy surface - even though it might be mirror-like after freezing - will become rougher from erosion and the grinding effect of tiny particles, or the deposition of atmospheric constituents," Prof Jaumann adds.

The image was taken at a wavelength of five microns (thousandths of a millimetre) and at a spacecraft distance of about 200,000 kilometres, resulting in an image resolution of about 100 km per pixel.

With a diameter of 5,150 kilometres, Titan is the largest moon of Saturn, the ringed planet. It is the only satellite in the Solar System surrounded by a dense atmosphere obscuring any direct view of its

surface. With spectrometers, though, it is possible to peek through the cloud and haze shrouded atmosphere of Titan through what are called 'atmospheric windows' to get some idea about the icy surface, which is at minus 180 degrees Celsius.



Titan - Saturn's moon with hydrocarbon lakes under a dense atmosphere

"Analysis of the VIMS data strongly suggest that this feature is specularly reflected sunlight from a liquid surface that is smooth on a five micron scale," explains VIMS team associate Dr Katrin Stephan (DLR, Berlin, Germany), who discovered the 'glint' in the VIMS data. In this spectral range a significant amount of sunlight directly reaches Titan's surface without being scattered by atmospheric particles so light that is specularly reflected from Titan's surface can be detected.

**Measurements suggest a surface from a liquid rather than from ice**

In comparison with radar images, the observation strongly points to a specular reflection from a smooth surface, close to the southern shoreline of Kraken Mare located in the northern hemisphere at 71° N and 337° W. Only where the viewing geometry is such that the specular point (mirror reflection point) falls onto one of the radar-dark surfaces do the VIMS observations show significant specular reflection. Ralf Jaumann, VIMS team member and head of the DLR Cassini group, points out that: "As VIMS observed the specular reflection just at the bright/dark boundary seen in the radar image acquired in 2006, the observation confirms the shoreline of Kraken Mare has been stable for the last three years, and the observation also suggests that the entire Kraken Mare basin is filled with liquid."

During the Cassini mission that arrived at Saturn in July 2004, the VIMS science team has concluded that liquid hydrocarbons like methane or ethane exist. These substances are liquid even at the freezing-cold temperatures on Titan. Prof. Jaumann and his DLR team have identified rivers, likely fed by precipitation. Along the course of the drainage systems, deeply incised valleys erode in the icy landscape of Titan. Therefore it was immediate possible to guess that these streams of hydrocarbons end up in lakes: the scientists from the VIMS team confirmed in 2008 that liquid ethane filled a lake located near the South Pole.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency (ESA) and the Italian Space Agency (ASI). The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate in Washington, D.C. The Cassini orbiter was designed, developed and assembled at JPL. The Visual and Infrared Mapping Spectrometer team is based at the University of Arizona, Tucson. The image processing was performed by Dyer Lytle from the VIMS operation team (University of Arizona). In Germany, the German Aerospace Center (DLR), the Max Planck Society (MPG) and several universities are

participating at the Cassini-Huygens project. Germany’s contribution to the mission adds up to approximately 120 million Euro.

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