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# Titan's lakes and Mare observed by the Visual and Infrared Mapping Spectrometer

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Titan is the only place, besides Earth, that holds stable liquid bodies at its surface. The large Kraken Mare, first seen by ISS [1], was then observed by the radar instrument that discovered a large number of small lakes as well as two other Mare [2]. The liquid nature of these radar-dark features was later confirmed by the specular reflection observed by the Visual and Infrared Mapping Spectrometer (VIMS) over Kraken Mare [3] and by the very low albedo at 5-micron over Ontario Lacus [4]. The three largest lakes are called Mare and are all located in the North Pole area. It is remarkable that most of these lakes have been observed on the North Pole with only one large lake, Ontario lacus, located in the South Pole area. This observation suggests the influence of orbital parameters on the meteorology and the occurrence of rainfalls to refill the depressions [5]. Ethane was detected by the VIMS instrument as one component of Ontario lacus [4]. These lakes and Mare play a key role in Titan's meteorology as demonstrated by recent global circulation models [6]. Determining the composition and the evolution of those lakes has become a primary science objective of the Cassini extended mission.
Since Titan entered northern spring in August 2009, the North Pole has been illuminated allowing observations at optical wavelengths. On June 5, 2010 the Visual and Infrared Mapping Spectrometer (VIMS) onboard the Cassini spacecraft observed the northern pole area with a pixel size from 3 to 7 km. These observations demonstrate that little of the solar flux at 5-micron is scattered by the atmosphere, which allowed us to build a mosaic covering an area of more than 500,000 km2 that overlaps and complements observations made by the Synthetic Aperture Radar (SAR) in 2007. We find that there is an excellent correlation between the shape of the radar dark area, known as Ligeia Mare and the VIMS 5-micron dark unit. Matching most of the radar shoreline, the 2010 VIMS observations suggest that the 125,000-km2 surface area of Ligeia Mare measured by RADAR in 2007 has not significantly changed [7]. The analysis of the 2-micron spectral window confirms the presence of ethane [8]. Because its saturation vapor pressure is several orders of magnitude smaller than that of methane, liquid ethane is expected to be very stable at Titan's surface conditions, which could explain the stability of the shorelines if ethane is the major compound of the lakes.
VIMS observations of Ontario Lacus are planned in 2012 before it disappears in the polar night. Several observations of the northern lakes are planned in 2012 as well as observations of the Mare later in the mission.

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