Cassini/VIMS Discovery of Organic Evaporite Deposits in Titan's Dry Lakebeds


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Near-infrared spectral mapping of Titan’s north polar lake district from the Cassini Visual and Infrared Mapping Spectrometer (VIMS) during the T69 flyby (2010 June 5) shows numerous, isolated ice-free spectral units. Comparison of the spectral map to RADAR data reveals that many of these units sit at the bottom of empty lakes as identified by the RADAR team. Because not all lakes show the spectral signature, and because nearby terrains and channel beds do not show it either, we interpret these deposits to be evaporites. On Titan, these would form by dissolution of haze or surface material by liquid methane, which then flows into seas and precipitates the solutes out as the methane evaporates. Most of the available soluble chemicals in Titan’s environment are organic, thus we expect that the composition of the evaporites is organic as well, though we are as yet unable to make a positive chemical identification. The presence of evaporitic deposits on Titan signifies a critical role for the methanological cycle in transporting and concentrating organic compounds, constrains the formation of Titan’s lakes, and suggests that other areas with similar spectral character (Tui and Hotel Regios) could plausibly represent lakebeds as well.

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This is a combined RADAR and VIMS view of the area south of Ligeia Mare on Titan that is to be the subject of the talk. Here in HSV color space VIMS has been assigned hue and saturation, and RADAR is the value. The evaporitic areas appear orange in this view, and many (but not all) correspond to steep-walled empty lakes as seen by RADAR.