Titan's terrains and northern lakes from SAR and high-resolution radiometry

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abstract:
The first five Titan flybys with Cassini's Synthetic Aperture RADAR (SAR) and radiometer are examined with emphasis on the calibration and interpretation of the high-resolution radiometry data acquired during the SAR mode (SAR-radiometry). Maps of the 2-cm wavelength brightness temperature are obtained coincident with the SAR swath imaging, with spatial resolution approaching 6 km. A preliminary calibration shows that brightness temperature in these maps varies from 64 to 89 K.
Surface features and physical properties derived from the SAR-radiometry mapsÂ and SAR imaging are strongly correlated; in general, we find that surface features with high radar reflectivity are associated with radiometrically cold regions, while surface features with low radar reflectivity correlate with radiometrically warm regions. We examined scatterplots of the normalized radar cross-section sigma 0 versus brightness temperature, finding differing signatures that characterize various terrains and surface features. Implications for the physical and compositional properties of these features are discussed. The results indicate that volume scattering is important in many areas of Titan's surface, particularly Xanadu, while other areas exhibit complex brightness temperature variations consistent with variable slopes or surface

material and compositional properties.
High Resolution Radiometry was also obtained along with the Synthetic Aperture Radar (SAR) imaging during T16 through T25 flybys of the norther polar region. The area at latitude above 75 degree North has shown a first clear evidence of hydrocarbon lakes on Titan. A preliminary radiometric characterization of selected lakes and the adjacent terrains is presented here. In general lakes composition suggest liquid hydrocarbons (dielectric constant = 1.6-1.7, Methane, ethane), path length ~ tens of meters and loss tangent ~10-4. The present data calibration is a preliminary result using an approach described in Janssen et al., 2007 (in prep.). Most recent flybys covering other areas in the northern leading hemisphere of Titan's show more evidence of lakes, however the analysis of the radiometry for these flybys have not been completed and therefore is not reported here.

- A major dike intrusion revealed by InSAR: the Lake Natron July 2007 rifting event (Northern Tanzania). N. d'Oreye et al.
Abstract: see attached.
(Estimated duration: 20 min)