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Correlations between VIMS and RADAR data over the surface of Titan: Implications for Titan's surface properties.

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We present new results combining the VIMS and RADAR data on Titan's surface. In RADAR data we consider two geophysical quantities: the normalized backscatter cross-section obtained from the scatterometer measurement, corrected for the incidence angle, and the calibrated antenna temperature determined from the radiometer measurement, as found in publicly available data products. In VIMS data, combining spatial and spectral information, we have selected some atmospheric windows in the spectral range between 2 and 5 μm, providing the best optical depth to measure surface reflectance.

The two RADAR parameters are combined with VIMS data, with estimated errors, to produce an aggregate data set, that we process using multivariate classification methods to identify homogeneous taxonomic units in the multivariate space of the samples. The use of data sets from different instruments onboard the Cassini spacecraft has the potential to deepen our understanding of the nature of the surface.

Our analysis relies on the G-mode method, which has been successfully used in the past for the classification of such diverse data sets as lunar rock samples, asteroids and planetary surfaces. Due to the large number of data of Titan, the classification work proceeds in several steps. In a previous work (Tosi et al., 2010), we analyzed the data acquired in Titan flybys: T3, T4, T8, T13 and T16, covering mostly the major bright and dark features seen around the equator, combined with VIMS infrared data, in order to validate the classification method. Now we focus on flybys: T23, T25, T28, T30, and T43, covering also regions of Titan located at higher latitudes, and partly including the polar regions.

The obtained results are generally in agreement with previous work devoted both to the analysis of the scatterometry data through physical models and to the correlation between SAR and radiometry data at a high resolution scale. This evidence, evaluated for the first time through a multivariate statistical method, constrains the geophysical models under development for the Titan surface.

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