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Chemical composition analysis of Titan's equatorial and midlatitude surface regions

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Chemical composition analysis of Titan's equatorial and midlatitude surface regions

Anezina Solomonidou et al.

The Cassini cameras and especially the Visual and infrared Mapping Spectrometer has provided a diversity of Titan's surface spectrum from flybys performed during the 13 years of Cassini's operation. Surface chemical composition is of great importance for the understanding of the atmosphere-surface interaction. The Soi crater region with the well-preserved Soi crater in its center, spans from Titan's equatorial regions to midlatitudes. This region provides a rich diversity of landscapes, one that is also representative of the diversity encountered across Titan. We present a study of the Soi crater region at 1:800,000 scale using Cassini SAR and non-SAR data and produced a geomorphological map using [1] and [2]. The VIMS coverage of the region allowed for detailed analysis of spectra of 262 different surface materials using a radiative transfer technique [3;4] and a mixing model [5;6], yielding compositional constraints on Titan's surface. Constraints on composition on the near-surface substrate were obtained from microwave emissivity. We identified three surface units, 3 of which were not previously described, and derived combinations of top surface materials between hydrocarbons, water-ice, and methane. We found no evidence of CO₂ and NH₃ ice. We also observe features which mark the most southern extent of Titan's north polar lakes. We use the stratigraphic relations between the geomorphology and the composition of the surface layers to build hypotheses about the regional geology.

[1] Malaska, M., et al. (2016), *Icarus* 270, 130; [2] Schoenfeld, A., et al. (2021), *Icarus* 366, 1145; [3] Schoenfeld, A., et al. (2014), *J. Geophys. Res. Planets*, 119, 1729; [4] Solomonidou, A., et al. (2016), *Icarus*, 270, 85; [5] Schoenfeld, A., et al. (2014), *J. Geophys. Res. Planets*, 123, 489; [6] Solomonidou, A., et al. (2020), *A&A* 641, A16.

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