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The spectral nature of Titan's mid-latitude region

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We infer surface properties, such as surface albedo and atmospheric contributions in the form of haze content, of the mid-latitude region of Titan. In previous studies [1;2] we reported results on two areas presenting indications for possible changes in surface albedo with time [2]. We also investigate the endogenic or exogenic processes linked to the formation of the various mid-latitude geomorphological units. These could be aeolian, fluvial, sedimentary, cryovolcanic, lacustrine, and more. Furthermore, deposition of organics through the atmosphere seems to be predominantly present [1]. We now focus on constraining the chemical composition of the various geomorphological units [5;6] by investigating the lower atmosphere of Titan from Visual and Infrared Mapping Spectrometer (VIMS) spectro-imaging data by use of a recently updated radiative transfer code in the near-IR range. For the distinction of geomorphological units we use RADAR/SAR data [4]. We study the units of interest identified in [1;3] and [4]: mountains, plains, labyrinths, dune fields, and possible cryovolcanic and/or evaporitic features (the latter two are albedo features, [4;5]). Our findings indicate that many of the regions from the same geomorphological unit show compositional variations depending on location, while units of significant geomorphological differences seem to consist of very similar material mixtures. Preliminary results on the chemical composition of the regions that have shown temporal changes (i.e. Tui Regio and Sotra Patera; [6]) are also presented. The albedo differences and similarities among the various geomorphological terrains set constraints on the possible geological processes that govern Titan's surface.

References: [1] Lopes, R.M.C., et al.: Icarus, 270, 162-182, 2016; [2] Solomonidou, A., et al.: Icarus, 270, 85-99, 2016; [3] Lopes, R.M.C., et al.: Icarus, 205, 540-558, 2010; [4] Malaska, M., et al.: Icarus, 270, 130-161, 2016; [4] Barnes, J., et al.: Pl. Scie., 2:1, 2013; [5] Solomonidou, A., et al.: JGR, 119, 1729-1747, 2014; [6] Schmitt, B., et al.: GhoSST database (ghosst.osug.fr).