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Potentially active regions on Titan: Application of differential spectroscopy on Cassini/VIMS data and correlation with filtered SAR data.

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We present a study of Titan's geology with a view to enhance our current understanding of the satellite's active zones. The determination of Titan's surface chemical composition is critical in order to unveil its geology and investigate the interactions between the interior, the surface and the atmosphere. Cassini/VIMS acquired a large amount of spectra and images taken within the narrow methane spectral windows centered at 0.93, 1.08, 1.27, 1.59, 2.03, 2.8 and 5-μm. However, the surficial imaging is still ambiguous due to haze scattering and particle absorption and needs to be clearly defined. We apply empirical methods [1], such as that of "differential spectroscopy" including an atmosphere-subtracted method and contrast analysis, on three potentially active regions on Titan: Tui Regio (20°S, 130°W) [2], a 1,500-km long flow-like figure, Hotei Regio (26°S, 78°W) [3], a 700-km wide volcanic-like terrain and Sotra Facula (15°S, 42°W) [4], a 235-km in diameter area, all of which have been proposed as candidates for cryovolcanism and are hence potentially active regions. With our methods of atmospheric subtraction and contrast analysis and additional modeling based on isolation of specific regions of interest of distinct and diverse chemical composition, we have managed to reduce the effect of the contribution of the atmosphere within the atmospheric methane windows and focus on the real alterations in surface composition, as well as to compare the three areas by means of spectral behavior. Furthermore, we have processed Cassini/SAR images using a despeckle filter [5] in order to characterize morphologically the surface expressions within the potential active zones. We present some suggestions for the chemical composition and the correlation with the morphological structures [6] within the cryovolcanic candidate areas.

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