

POTENTIALLY ACTIVE REGIONS ON TITAN: PROMISING LANDING SITES

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The highly successful Cassini-Huygens mission to the Saturnian system provides us with valuable scientific results and discoveries of many complex phenomena while at the same time points to the need for a return mission as a high priority in space exploration [1]. The Titan Saturn System Mission (TSSM) is a joint NASA/ESA proposal for the exploration of Saturn and two of its moons, Titan and Enceladus [2]. One of the mission's goals is to achieve a safe and successful landing on a Titan location that will combine a variety of geological aspects that are simultaneously attached to the atmospheric processes. In this study we present two candidate active regions on Titan [3] that present multivariable geomorphology [4]. Tui Regio is a large lobate 5 μ m-bright region that lacks the erosion channels that mark other highland regions on Titan, suggesting it may be geologically young. Data acquired from the Cassini Visual and Infrared Mapping Spectrometer (VIMS) and Imaging Science Subsystem (ISS) indicate the area may be a flow field resembling lava flows and volcanic edifices. Many indications suggest this area could be a good candidate for current volcanic activity [5]. Another enigmatic cryovolcanic candidate is Hotei Regio, which is an area of extremely complex geology [6]. VIMS and Radar data present an area anomalously bright at 5 μ m with diverse roughness. Hotei Regio includes a basin filled with lava flows and caldera-like features, mountainous terrain, dark blue patches and possibly alluvial deposits. In addition the bright arc named Hotei Arcus ("The smile"), at the Southern margin of Hotei Regio, might be a heavily eroded crater [7].

Furthermore, episodic outgassing has been suggested as the most likely explanation for Titan's atmospheric methane [8], which endorses the candidacy of Tui Regio and Hotei Regio for landing sites due to their possible cryovolcanic origin. Thus, a future in situ mission could reveal not only cryovolcanic edifices but also the presence of both a subsurface water ocean and a rocky core. The aforementioned landing site candidates represent opportunities to answer some important scientific requirements for a future mission by presenting extremely interesting and variable geologic and topographic aspects.

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