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Morphotectonic features on Titan and their possible origin

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Titan, Saturn's satellite, is one of the most interesting planetary bodies in the Planetary Geology domain. Spectro-imaging and radar measurements by the Cassini-Huygens, joint ESA/NASA mission, suggest that it may be geologically active and could support tectonic processes. In particular, Titan possesses a complex and dynamic geology as witnessed by its varied surface morphology resulting from aeolian, fluvial, and possibly tectonic and endogenous cryovolcanic processes. The Synthetic Aperture Radar (SAR) instrument, on board Cassini spacecraft, indicates the possibility for morphotectonic features on Titan's surface such as mountains, ridges, faults and canyons [1; 2; 3; 4]. Additionally, cryovolcanic structures like calderas, domes, flows and radial faults [3] are surficial indications of volcanotectonic activities. The mechanisms that formed these morphotectonic structures are still unclear since ensuing processes, such as erosion may have modified or partially obscured them. Due to the limitations of the Cassini-Huygens in the acquisition of in situ measurements or samples relevant to geotectonic processes and the lack of high spatial resolution imaging, we do not have precise enough data of the morphology and topography of Titan. However, we suggest that contractional tectonism followed by atmospheric modifications has resulted in the observed morphotectonic features. To test the possibility of morphotectonics on Titan, we provide in this work a comparative study between Cassini observations of the satellite versus terrestrial tectonic systems and infer suggestions for possible formation mechanisms.

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