



Modélisation of tidal flows between Titan's seas Kraken Mare and Ligeia Mare

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Numerous lakes and seas filled with liquid hydrocarbons have been detected on Titan's surface by Cassini spacecraft [1]. Most of these liquid bodies are located in the northern high latitudes [2]. In this study, we focus on two of them: Kraken Mare and Ligeia Mare and in particular on the tidal currents between them. Recent observations of the Visual and Infrared Mapping Spectrometer (VIMS) from February 12, 2015 suggested the presence of waves in a strait called Trevice fretum linking the two seas [3]. These waves could be generated by either wind or strong currents between Kraken Mare and Ligeia Mare.

We simulate the tidal response of Kraken Mare and Ligeia Mare and the currents in the straits linking those seas with SLIM (Second-generation Louvain-la-Neuve Ice-ocean Model, www.climate.be/slim). SLIM resolves 2D shallow water equations on an unstructured mesh, which allows higher accuracy in the straits without drastically increasing the computational costs. It has been recently used to simulate the tidal response in Ontario Lacus [4]. The tide generating force modelled in this work is the gradient of tidal potential due to Titan's obliquity and Titan's orbital eccentricity around Saturn (other contribution such as sun tide generating force are unheeded). Kraken Mare and Ligeia Mare composition might be different. Consequently, fluid exchanges could also occur due to a density gradient between those seas. In this study, we focus on the flow in the strait between Kraken Mare and Ligeia Mare and consider the effect of parameters such as the composition, solid deformations and the depth of the strait.

[1] Stofan et al. (2007) Nature, 445, 61-64. [2] Aharonson et al. (2009), Nature geoscience, 2(12), 851-854. [3] Sotin et al. (2015) AGU, P12B-04. [4] Vincent et al. (2016) Ocean Dynamics.