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Tides and eigenmodes of an idealized subsurface global ocean on Titan

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Several moons of the solar system have a global subsurface ocean filled with liquid water beneath their surface. The depth of such oceans are unknown to this day although a maximum and a minimum depth can be estimated by means of models. Stevenson [1] was the first to suspect the presence of a global subsurface ocean beneath an icy shell on Titan. Evidence of the existence of such an ocean global was collected by Cassini as soon as 2004 [2]. Such a liquid body is likely to generate significant tidal motion and, hence, significant displacement of Titan's surface.
The tidal motion in the global ocean Is simulated by means of SLIM (Second-generation Louvain-la-Neuve Ice-ocean Model, www.climate.be/slim). First, the ocean surface is considered free. The eigenmodes of such an ocean are studied to assess the likelihood of resonance due to the tides. Then, the interactions with the icy surface of Titan are studied. To this end, a 1D model is used to predict the deformations of the surface taking into account a pressure term due to the surface elevation of the subsurface ocean.

[1] Stevenson, D. J. (1992). Interior of Titan.
[2] Sotin, C., & Tobie, G. (2004). Internal structure and dynamics of the large icy satellites. Comptes Rendus Physique, 5(7), 769-780.