Geophysical Research Abstracts
Vol. 17, EGU2015-11794-3, 2015
EGU General Assembly 2015

Numerical simulation of tides in Ontario Lacus

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Hydrocarbons liquid filled lakes has been recently detected on Titan's surface. Most of these lakes are located in the northern latitudes but there is a substantial lake in the southern latitudes: Ontario Lacus. This lake gets our attention because of possible shoreline changes suggested by Cassini flybys over Ontario Lacus between September 2005 (T7) et January 2010 (T65). The shoreline changes could be due to evaporation-precipitation processes but could also be a consequence of tides.
Previous studies showed that the maximal tidal amplitudes of Ontario Lacus would be about 0.2m (for an uniform bathymetry of 20m).
In this study we simulate tidal amplitude and currents with SLIM (Second-generation Louvain-la-Neuve Ice-ocean Model, http://sites.uclouvain.be/slim/) which resolves 2D shallow water equation on an unstructured mesh. Unstructured mesh prevents problems like mesh discontinuities at poles and allows higher accuracy at some place like coast or straits without drastically increasing computing costs. The tide generating force modeled 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). The uncertain input parameters such as the wind direction and amplitude, bottom friction and thermo-physical properties of hydrocarbons liquids are varied within their expected ranges. SAR data analysis can result in different bathymetry according to the method. We proceed simulations for different bathymetries: tidal amplitudes doesn't change but this is not the case for tidal currents.
Using a recent bathymetry deduced from most recent RADAR/SAR observations and a finer mesh, the peak-to peak tidal amplitudes are calculated to be up to 0.6 m. which is more than a factor two larger than the previous results. The maximal offshore tidal currents magnitude is about 0.06 m/s.