



Bathymetry underneath the Ross Ice Shelf, Antarctica, from the tidal measurements of ICESat: A preliminary analysis

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The bathymetry underneath the Ross Ice Shelf (RIS) and other ice shelves in Antarctica is poorly known. While there was recent advance in accurate determination of the grounding lines from the satellite data, the bathymetry underneath the RIS still rely on coarsely spaced water column thickness measurements reported by Greischar & Bentley (1980). The uncertainty of bathymetry is one of the factors that make tidal assimilations and tidal corrections of satellite data inaccurate. We analyze the sensitivity of bathymetry to the barotropic tides by exploiting the computer codes (such as Oregon state university Tidal Inversion Software) implementing the shallow water dynamic equation. The effects of frictional dissipation and the boundary conditions on tides are also discussed. In order to improve the bathymetry underneath the RIS, we parameterize the bathymetry and explore nonlinear inversion schemes of the ocean tidal measurements from ICESat laser altimetry. Finally, we validate the reliability of inverted bathymetry through the cross validation of the data sets from independent measurements from various ICESat campaigns.