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New unconstrained global ocean tide solutions for satellite gravimetry including minor tides

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The quality of global ocean tide models has increased drastically over the last decades due to the availability of dense open-ocean observations from satellite altimetry. In regions of poor altimetry coverage (e.g., polar seas and coastal areas) and for minor tides with a small signal-to-noise ratio, however, reliable estimates from unconstrained global numerical models are still (and will remain) critically important. We will present in this contribution recent results from the purely-hydrodynamic, barotropic tidal model TiME (Weis et al., 2008) that benefit from a newly introduced rotated grid avoiding the singularity at the North Pole; a revised scheme for dynamic feedbacks of self-attraction and loading; and revised bathymetry data-sets that also include water column height modifications in cavities underneath the Antarctic ice-shelves.

By focussing exemplarily on the M_2 tide, we will demonstrate the individual impact of all those changes on the simulated water height variations. It will be shown that the effects of ice-shelf cavities extend well beyond the Southern Ocean and affect even amphidromic systems in the Northern Hemisphere. We will also emphasize the ability of unconstrained numerical models as TiME to explicitly simulate minor tidal lines, thereby allowing to thoroughly test (and subsequently improve) admittance-based methods currently employed for the processing of satellite gravimetry data from the GRACE and GRACE-FO missions.

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