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Improved ocean tide in Antarctica from GRACE and hydrodynamic assimilation

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We report our on-going effort on the ocean tide recovery from GRACE and the updated results of Han et al [2007]. Three constituents (M2, O1, and S2) of the ocean tides around the Antarctica were estimated from five years of GRACE satellite-to-satellite ranging measurements. The tides were parameterized as localized average mass anomalies over areas approximately 300 km by 300 km. An inversion was performed for satellite initial state adjustments as well as the major constituents, simultaneously. The ocean tidal estimates infer the updates on the a priori tide models used in the orbit integration for GRACE processing. We analyzed the up-to-date (global) ocean tide models such as GOT4.7, FES04, and TPXO7. The GRACE estimates with respect to those models were used to assess the quality of the models around the Antarctica including the ice shelves. We discuss large-scale errors in the respective models, variable with geographical regions and tidal constituents. As the GRACE time series lengthen, we anticipate tidal solutions to improve and also to extend to more constituents, including K1 tide. This should enhance other applications, including a more reliable estimation of inter-seasonal climate signals. We finally discuss assimilation of these first-ever gravimetric estimates uniformly covering Antarctica to improve the high-resolution ocean tide models.