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Mitigating Spatial Leakage in Monthly GRACE/GRACE-FO Gravity Fields for the Separation of Barystatic Sea-Level Variations and Residual Ocean Circulation Effects

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Temporal variations in the total ocean mass representing the barystatic part of present-day global mean sea-level rise can be unambiguously inferred from time-series of global gravity fields as provided by the GRACE and GRACE-FO missions. A spatial integration over all ocean regions, however, largely underestimates present-day rates as long as the effects of spatial leakage along the coasts of in particular Antarctica, Greenland, and the various islands of the Canadian Archipelago are not properly considered.

Based on the recent release 06 of monthly gravity fields processed at GFZ, we quantify (and subsequently correct) the contribution of spatial leakage to the post-processed mass anomalies of continental water storage and ocean bottom pressure. Utilising the sea level equation allows to predict spatially variable ocean mass trends out of the (leakage-corrected) terrestrial mass distributions from GRACE and GRACE-FO. Consistent results for the global mean barystatic sea-level rise are obtained also from spatial integrations over ocean masks with different coastal buffer zones ranging from 400 to 1000 km, thereby confirming the robustness of our method. Residual month-to-month variations in ocean bottom pressure are indicative for errors in the monthly-mean estimates of the applied de-aliasing model AOD1B RL06 and will be thus contrasted against very recent MPIOM experiments considered for AOD1B RL07. The in this way improved leakage correction will be implemented in future GravIS versions (http://gravis.gfz-potsdam.de).