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Evaluation of GRACE RL06 analysis in the Southern Ocean

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Space geodetic estimates of ocean bottom pressure (OBP) derived by several analysis centres are evaluated. To this end, an array of 14 in situ bottom pressure recorders has been deployed between South Africa and Antarctica. The continuous measurement period of four years (2011 to 2014) and a recorder spacing of roughly 2.8 degrees latitude allows an in-depth analysis of bottom pressure variability.

Our goal is to relate OBP from GRACE to in situ observations and detect which spatial and temporal features are reproduced. The recorders in the southern part of the transect generally tend to be in better agreement with GRACE and better reflect longer spatial scales of ocean bottom pressure. Over the vast expanse of the Antarctic Circumpolar Current annual and semi-annual cycles are weak (about 1cm equivalent water height (EWH)) and not reproduced well by GRACE. Variability in general amounts to a standard deviation of 2cm. This level is well captured and correlations on the order of 0.5 are found.

Mean values and trends of OBP cannot be identified due to the instrumental setup. Close to the Agulhas Retroflexion, signals of up to 30cm EWH are found, which cannot be resolved by GRACE. Our analysis reveals: GRACE OBP possesses longer space and time scales than in situ OBP and it misses eddy-scale signals. Filtering with DDK4 appears to be preferable to DDK6.