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Can we use current geoid models for improving ocean state estimation?

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So-called complete gravity field models together with their full error variance/covariance information have recently been designed to be integrated into geo-scientific process models. In our project RIFUGIO (Rigorous Fusion of Gravity Field into Stationary Ocean Models), we investigate whether it is possible to improve estimates of the general ocean circulation by considering the ocean's mean dynamic topography. For this purpose the altimetric mean sea surface height referenced to the geoid is assimilated in stationary regional ocean models. We combine complete gravity field models with altimetric data for which a full error propagation including the omission error is also implemented in the processing. Thus we derive estimates of the ocean's mean dynamic topography with a regular covariance matrix.
While GRACE data are very accurate on large scales, their low resolution leads to a large omission error. The combination with the transformation of the spherical harmonics expansion of the gravity field onto a finite grid causes a leakage of short scales into long scales. Therefore neglecting the omission error yields a by far overestimated accuracy. Our results that explicitly take the omission error into account show that GRACE data are not accurate enough to improve ocean flux estimates in the Southern Ocean significantly.