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Variations of ocean mass from a Finite Element Sea-Ice Ocean Model (FESOM)

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Within the project JIGOG (joint inversion of GPS site displacements, ocean bottom pressure and GRACE gravity) weekly OBP anomalies are modeled for the period of time from 2003 to 2006 using the Finite-Element Sea-Ice Ocean Model (FESOM, Timmermann et al., 2008). Estimating the error is a crucial aspect when modeling OBP anomalies. For this reason, the internal error is estimated by a second model simulation with different discretization. The main differences are in the ocean bottom topography as it has strong influence on large scale ocean waves and current systems. The result is interpreted as a lower limit because it is based on numerical discretization only. Another error source is the dependence of the global fresh water balance on the atmospheric conditions, which are forcing the model. Therefore, the impacts of the atmospheric datasets, either from NCAR/NCEP or ECMWF, to the model results are investigated.

The combined inversion of weekly OBP anomalies, weekly GRACE gravity data and GPS site displacements provides among others load coefficients and a model bias. Here, the model bias is defined as the difference of the global mean ocean mass variations of the inversion results and the model simulation results. The model bias has zero mean and a standard deviation of 0.4mm per day. It can be used to improve the fresh water cycle of the model. This is done by scaling precipitation with the bias because this datasets contains high uncertainties. First results are shown when simulating OBP anomalies with the improved freshwater cycle. Results are compared with in-situ ocean bottom pressure measurements from recorders while discussing accuracies of modeled OBP anomalies.