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Synthesis of Mean Dynamic Topography Data and a North Atlantic Ocean Model

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Many characteristics of the ocean circulation are reflected in the mean dynamic topography (MDT). Therefore observing the MDT provides valuable information for ocean models. Using this information is complicated by the inconsistent representations of the different observations and ocean models. This presentation describes a consistent treatment of altimetry data and geoid height information obtained from satellites such as Jason1, GRACE and GOCE. The MDT is parameterised by finite elements directly on the ocean model grid. The geodetic normal equations for the MDT can be estimated in a straightforward way without the usual inversion and smoothing processes. These normal equations provide appropriate weights for model-data misfits in least-square ocean model inversions. Former MDT estimates neglect the omission error in the modelling process. Here, two MDT model approaches assuming different amount of knowledge about the omission error are compared to each other with respect to their influence on the ocean model.
Assimilation of the new MDT into the North Atlantic Ocean model reveals some remarkable new features: a generally accelerated circulation, a more pronounced Gulf Stream, increased deep water formation at high latitudes and modified meridional heat transport estimates.