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Sequential assimilation of multi-mission dynamical topography into a global finite-element ocean model

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Sequential assimilation of ocean dynamic topography, derived from altimeter data combined with a referenced earth geoid, into gen- eral circulation ocean models is a complex problem. Our previous study based on the finite-element ocean model (FEOM) revealed the existence of a significant systematical bias between the mean dynamic topography of the model and ocean dynamic topography. To overcome this problem an adiabatic pressure correction method was used which reduces model drift from the mean ocean dynamic topography. Another difficulty for the sequential assimilation of surface data is related to projection of the surface perturbation update to the layers of the ocean model. To this end a method is used according to which the temperature and salinity are updated following the vertical structure of the first baroclinic mode. It is shown that the method leads to a partially successful assimilation approach reducing the RMS difference between the model and data from 16 cm to 2 cm. This improvement of the mean state was accompanied by significant improvement of temporal variability in our analysis. However, it remains suboptimal, showing a tendency in the forecast phase of returning toward a free run without data assimilation. To improve the analysis quality and to reduce the tendency of the model to reject the changes made by the filter another approach is proposed based on the correlation between a steric height and elevation variability. The results of such an approach are discussed and compared to the results of our previous work.