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A pre-operational 3-D variational data assimilation system in the North/Baltic Sea

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This paper describes the implementation and evaluation of a pre-operational three dimensional variational (3DVAR) data assimilation system for the North/Baltic Sea. Univariate analysis for temperature and salinity is applied in a 3DVAR scheme in which the horizontal component of the background error covariance is modeled by an isotropic recursive filter (IRF) and the vertical component is represented by dominant Empirical Orthogonal Functions (EOFs) of the background error. Observations of temperature and salinity (*T/S*) profiles in the North/Baltic Sea are assimilated in the year of 2005. Effect of the 3DVAR scheme is assessed by a comparison between data assimilation run and control run. The statistical analysis indicates that the model simulation is significantly improved with the 3DVAR scheme. On average, the root mean square error (RMSE) of temperature and salinity is reduced by 0.2 °C and 0.25 psu in the North/Baltic Sea. In addition, the bias of temperature and salinity is also decreased by 0.1 °C and 0.2 psu, respectively. Starting from an analyzed initial state, one month simulation without assimilation is carried out with the aim of examining the persistence of the initial impact. It is shown that the assimilated initial state can impact the model simulation for nearly two weeks. The influence on salinity is more pronounced than temperature.