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Assimilation of alongtrack satellite SSH altimetry in a coastal circulation model off Oregon

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A variational representer-based method is utilized to assimilate alongtrack SSH altimetry observations in a 6-km resolution model of circulation over the shelf and in the coastal transition zone (CTZ) off Oregon (US West coast). The nonlinear model is based on Regional Ocean Modeling System (ROMS). For assimilation, AVRORA tangent linear and adjoint codes developed by the authors have been used. The study period is summer 2008, when the shelf circulation is dominated by the southward alongshore current and upwelling. Throughout the season, coastal currents become unstable and separate in the CTZ. The Oregon shelf is narrow such that the AVISO alongtrack altimetry products do not extend to the shelf. However, these data show spatial variability, on scales of several tens of km, associated with separation of the coastal currents in the CTZ. We perform tests using the Jason data (AVISO absolute dynamic topography) from one track to verify that assimilation of these data can help correct the location of the energetic separated current off Cape Blanco, and that this correction helps to improve forecasts locally over a period of 10 days, until new observations are available along the same track. Also, the impact of assimilation is verified against unassimilated data (satellite SST, coastal HF radar, glider cross-shore hydrographic sections). We find that the success of assimilation strongly depends on the choice of the initial error covariance. The implementation of the covariance based on the multivariate balance operator yields promising results.