Assimilation of Northwestern Tropical Pacific moored velocity data in a regional ocean modeling: Low frequency capabilities

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The Northwestern Tropical Pacific Ocean (NWTPO) moorings observing system, including 15 moorings, was established in 2013 to provide velocity profile data. An Ensemble Optimal Interpolation (EnOI) is implemented for a Regional Ocean Modeling System (ROMS) to assimilate moored velocity profile data (October 2014–August 2015). The alternating zonal currents are the main characteristics of the upper circulation in the NWTPO, and the differences of zonal velocity between moorings and model outputs are mainly reflected in a low-frequency time scale (>90 days), which show a zonal flow-dependent large scale signal. Considering of the strong variations of the NWTPO circulation on multiple time scales, only 90-day low-pass-filtered zonal velocity without intraseasonal signals are assimilated into model to impove the simulation of position and intensity of currents. To match the low-frequency observation, the ensemble is low-pass-filtered with above 90 days and the instantaneous background fields are filtered in horizontal space. The signals of model outputs in the intraseasonal time scale are retained. Significant improvements are achieved for the simulation of position and intensity of the North Equatorial Current (NEC), the North Equatorial Countercurrent (NECC), and the Equatorial Undercurrent (EUC). More importantly, the temperature and salt fields can be reconstructed reasonably, and also the geostrophic balance can be well kept.