Development of the EnOI-based oceanic data assimilation system for NEMO

Jeong-Gil Lee, Yoo-Geun Ham, Ji-Gwang Kim
Department of the Oceanography, Chonnam National University

In this study, the EnOI(Ensemble Optimal Interpolation)-based offline data assimilation(DA) system is developed for the NEMO(Nucleus for European Modelling of the Ocean) ocean dynamical model to assimilate the ocean temperature and salinity profile from in-situ observation data(ARGO free-floating and TOGA/TAO, PIRATA, and RAMA mooring data). To overcome the limitation of the 3DVAR method with fixed background error covariance matrix based on the diffusion model in NEMOVAR, we developed the algorithm to generate flow-dependent background error covariance matrix which allows to spread the observational increment along with isopycnal. 12 ensemble perturbations using long time integration of the model(1997-2008) is also used to compose of the BKG covariance matrix. To adjust the amplitude of the perturbations for the background error covariance matrix, we adjusted observation error variance based on the relative amplitude ratio between the observational increment and the observational error. The EnKF-based Local Analysis system is used to localize the BKG error covariance matrix. Development of the MPI-based parallelization system for efficiency of calculation is also carried out.

We confirmed that the BKG error covariance pattern that determines the analysis increment pattern matches the assimilation result in the single ideal OBS DA experiment. It implies that the NEMO offline DA system is successfully setup practically. The real OBS DA experiment for 1 time-step is also successfully done. This offline DA system will be coupled to the NEMO model and then the verification will be also carried out.

**Key words:** Data assimilation, Ocean model, EnOI, Ocean observation, Ocean reanalysis

※ This study was supported by the Korea Meteorological Administration Research and Development Program under Grant KMI2018-03110.