An LETKF-based ocean reanalysis for the Asia-Oceania region using Himawari-8 SSTs and SMOS/SMAP SSS

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With the global spread of the Argo floats and development of high-resolution ocean models, global ocean reanalysis datasets have been released. Although regional high-resolution ocean reanalysis datasets also have been established around the North Pacific, most of their coverage area is limited to regions north of 10°N. We suggest that reanalysis datasets for tropical-subtropical oceans are yet to be constructed for coastal environmental monitoring and typhoon researches around the Asia-Oceania region.
Since July 2015, a geostationary satellite "Himawari-8" has been measuring sea surface temperatures (SSTs) with a high spatial and temporal resolution of 2 km and 10 min. in the western Pacific region using an infrared sensor. Because of the high temporal resolution, daily composite map shows that coverage area of Himawari-8 exceeds that of an orbital satellite "GCOM-W" with a microwave sensor. The infrared sensor enables us to capture fine nearshore SST structure, such as localized cool SSTs induced by Ekman upwelling along the Vietnam coast during the southwesterly summer monsoon.
We have established a one-way nest high-resolution ocean data assimilation system based on LETKF (Hunt et al. 2007) with 20 ensemble members at 1-day interval. The southeast Asia coastal region [98°–115°E, 0°–22°N] has been modeled at a spatial resolution of 1/36° and 47 layers with an intent to be applied for fishery and marine environmental monitoring, while the large-scale western Pacific region [95°E–165°W, 50°S–50°N] has been constructed at a spatial resolution of 1/12° and 47 layers to make contributions to tropical cyclone studies. Himawari-8 SSTs and sea surface salinity (SSS) derived from SMOS and SMAP satellites as well as sea surface height, and temperature/salinity derived from GTSPP and AQC Argo dataset have been assimilated. To improve the salinity field, freshwater fluxes also have been incorporated. To avoid generation of spurious gravity waves, the Incremental analysis Update (IAU) filter (Bloom et al. 1996) have been implemented. We will introduce low salinity water transport from the Mekong river in the southeast Asia system and the SST cooling with the passage of tropical cyclones in the western Pacific system.

Keywords: southeast Asia, western Pacific, data assimilation, LETKF, Himawari-8, SMOS/SMAP