Salinity improvements in the NOAA's US West Coast Ocean Forecast System (WCOFS)

Parisa Heidary[1], Alexander Kurapov[1], Bahram Khazaei[1], Jiangtao Xu[1]

[1]*Physical Scientist, National Oceanic and Atmospheric Administration (NOAA)*

Abstract

The West Coast Ocean Forecast System is developed and run operationally by the NOAA National Ocean Service (NOS) since March 2021. It produces 3-day forecasts of oceanic conditions in a dynamic shelf and adjacent interior ocean area in Northeastern Pacific dominated by the seasonal upwelling, energetic alongshore currents, river influences, instabilities, and shelf current separations into the interior ocean. The forecasts are used to guide navigation, fishers' daily operations, search and rescue, marine biology studies, oil spill response, etc. WCOFS is based on the Regional Ocean Modeling System (ROMS) and uses the ROMS 4DVAR component to assimilate observations of sea surface height from 5 nadir altimeters, sea surface temperature from a constellation of polar-orbiting and geostationary satellites, and surface currents from a national backbone of land-based high-frequency radars (HFR). The present operational system does not assimilate any in-situ observations. Current efforts are focused on improvements in the sea surface salinity (SSS) and the subsurface variability in temperature (T) and salinity (S). These efforts are undertaken in progression to document impacts of different parts of the system: (1) the full suite of terrestrial discharges are added, using outputs from the Global Flood Awareness System (GloFAS), to improve seasonal cycle in SSS, (2) the model error variance for salinity, increased at the realistic level in preparation of salinity data assimilation, may result in large potential erroneous changes in surface and subsurface salinity and at the same time improvements in subsurface temperature, (3) assimilation of Argo and glider T/S data reduced the SSS bias and improves the structure of the upwelling front and variability over the shelf compared to near-surface and near-bottom time series moored observations, and (4) assimilation of SMOS satellite salinity helped to constrain spurious variability in SSS corrections.