



Formation and evolution of East Sea Intermediate Water in a high resolution ocean reanalysis

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The East Sea Intermediate Water (ESIW) is a water mass characterized by the salinity minimum in the East/Japan Sea, which is a marginal sea surrounded by Korean peninsula, Japanese islands, and far-east Russian coast. It is important to understand the formation and circulation of ESIW and its inter-annual variability, because the ESIW carries heat, dissolved oxygen, and nutrient fluxes supplied by the air-sea interaction into the intermediate layer of the East/Japan Sea. We here investigate the origin, formation and fate of the ESIW using an ocean reanalysis produced by the Ocean Predictability Experiment for Marine environment (OPEM) by the Korea Institute of Ocean Science and Technology (KIOST). It is based on the GFDL Modular Ocean Model version 5 (MOM5) and covers the northwestern Pacific (98°–170°E, 5°–65°N) including the East/Japan Sea. Its horizontal resolution is 1/24° both in longitude and latitude and has 51 vertical levels with enhanced resolution near the surface. The surface boundary forcing has been calculated from the Korea Meteorological Agency global atmospheric dataset by applying the bulk formula. The lateral boundary conditions are prescribed by the Operational Mercator global ocean analysis. Sea surface temperature (NCDC OISST, GHRSSST) and temperature-salinity profiles (ARGO, KODC, GTSP) are assimilated with an Ensemble Optimal Interpolation method. We analyzed reanalysis data from 2015 to 2018. The depth of the salinity minimum from the OPEM matches well with the observed one. Our analysis suggests that the major source of the ESIW is the low salinity water along the Russian coast originated from the Amur River and sea-ice melt water. Even though the ESIW is formed near the south of Vladivostok during winter and extends southward below the mixed layer, its characteristics are varying inter-annually. The salinity of the ESIW in 2018 is higher than that in other years, which corresponds to the decrease of the low salinity water transport along the Russian coast during 2017.