Introduction to Korean Operational Oceanographic System (KOOS)

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The adjunct seas around the Korean Peninsula (KP) have unique ocean environments owing to its geological features. The Yellow Sea which located in the western part of KP has relatively shallow (average depth about 45 m with huge area of tidal flat) and tide dominate (up to 3 m/s during spring tides). On the other side, the east coast has very week tide but the East Korea Warm Current (EKWC) and the North Korea Cold Current (NKCC) persist. Both currents are belonged to the East/Japan Sea having average depth about 1,700 m. The south coast has many small islands and both tide and currents.

The Korea Institute of Ocean Science and Technology (KIOST) has been established KOOS (Korea Operational Oceanographic System) project during the first stage (Aug. 2009 to Jun. 2013). The second phase of the study (Oc. 2013 to Apr. 2018) secured technology for 72 hours of sea states, ocean circulation, and the regional sea (northwest Pacific, 1/24°, KOOS-OPEM) to the coastal circulation (all coasts, 300 m resolution, Coastal KOOS) twice a day. The third stage KOOS research project (Aug. 2018 to Jun. 2023) is conducting research on four detailed topics: prediction accuracy evaluation research, prediction accuracy improvement research, artificial intelligence-based marine prediction system development, and user utilization system with the aim of improving the accuracy of each prediction system and practicalizing research results. It is worth noting that by establishing global marine weather (MPAS-A, 15-60 km) and marine circulation system (MOM6, 1/12°)

However, due to the complex coastline, topography, and numerous islands, the need to establish an unstructured grid system has emerged, and an unstructured grid coastal prediction system that secures resolution up to 10 m off the coast is established and verified and conducted on-the-job research. In addition, we are conducting research on the applicability of the atmospheric-ocean-wave combined prediction system for stable field operation, and research is also being conducted to apply marine prediction of artificial intelligence techniques such as machine learning, which has recently emerged. In the prediction system, prediction accuracy collects observation data that can be collected from related organizations in Korea and around the world as much as possible, including satellite data, and evaluates a total of six marine items (sea wind, tide, flow velocity, water temperature, salinity, and wave) after a series of data processing and quality control. Salinity is evaluated using only KODC data from the National Institute of Fisheries Science due to insufficient observation data, and the remaining five items present CF values, skill scores, and statistical values. In order to overcome the limitations of the concentration of most of the observation data near the coast and evaluate the prediction system more objectively, a temporal and spatial verification study of marine phenomena (thermo-haline fronts, mixed layers, surface current fields, upwelling, low-salinity water, and hypoxia water mass) were also being studied. In order to achieve the successful goal of this project, a council of related organizations (industrial, academic, research, and government) has been formed to provide advice on the application of the field, identify needs, and expand joint research and cooperation with related organizations. International cooperation continues to carry out mutual exchange and cooperation activities on the development, advancement technology, and operation of prediction systems through GODAE Ocean Predict and NEAR-GOOS.