Development of an Operational Observation-Based Verification Framework for Ocean Forecasting Models at KHOA

DO-SEONG BYUN[1], JU-EUN PARK[1], UK-HYEON JUNG[1], YUN-SEOK KIM[1], JONG-GWAN[1]

[1]Korea Hydrographic and Oceanographic Agency

Abstract

The Korea Hydrographic and Oceanographic Agency (KHOA) operates eight ocean forecasting models across regional-to-coastal domains and produces hourly forecasts of sea surface height, currents, temperature, and salinity.

To support consistent and objective evaluation of these operational products, KHOA has established an observation-based verification framework that accounts for differences in spatial resolution, temporal sampling, and vertical coverage between model outputs and observational datasets, while explicitly considering forecast lead time. The framework was developed with reference to the Class 1–4 verification concepts of the GODAE OceanView Intercomparison and Validation Task Team (IV-TT).

The framework consists of four complementary verification components: station-based time-series verification, satellite-based gridded verification, CTD-based vertical profile verification, and Korea Strait transport verification. Station-based verification compares model forecasts with time-series observations from tide gauges and ocean buoys, while satellite-based gridded verification evaluates spatial forecast skill against satellite-derived products. CTD-based verification compares modeled and observed vertical profiles of temperature and salinity, and transport verification compares model-derived volume transport through the Korea Strait with transport estimates inferred from sea-level observations. The framework produces standardized metrics, including bias, root-mean-square error, and correlation, enabling consistent comparison of model performance across variables, depths, forecast lead times, and observation types.

This unified framework enables routine and objective assessment of operational ocean forecast skill and provides a basis for diagnosing model performance and guiding improvements in KHOA's ocean forecasting system. It is being further extended to include standardized event-based verification for major marine phenomena, including high-temperature and low-salinity events, in response to increasing demands from fisheries and other marine sectors.