Applying MOM6 for High-Resolution Coastal Modeling of Yeosu-Gwangyang Bay, Korea

Accurate coastal current prediction is crucial for enhancing marine environments and responding to maritime accidents. Yeosu-Gwangyang Bay in Korea, which hosts an industrial estate and ferry terminal, experiences various types of ship traffic. Most of the bay is shallow, with depths less than 40m, and is a semi-enclosed sea where freshwater flows from the Seomjin River mixes with seawater from Yeosu Bay. Understanding the 3-dimensional currents in this area is essential for its safe use, give the frequent ship access and complex currents. In this study, we established a high-resolution coastal model using MOM6. We confirmed that the model's performance in a narrow region is stable. The tidal results closely matched the observation data, and the current patterns aligned well with ADCP data trends. However, discrepancies in the exact values prompted us to improve the model's performance through data assimilation. We developed a data assimilation system to integrate Coastal Acoustic Tomography(CAT) data into the numerical model. CAT is a remote sensing method that infers physical variables such as temperature, salinity, and current by using the speed of ocean acoustic propagation. We assumed that the travel time difference obtained from CAT corresponds to the current speed and applied the Ensemble Kalman filter(EnKF) method. This study aims to achieve accurate 3-dimensional current predictions by establishing an observation operator and data assimilation system using CAT.

Nayoung Park(Division of Earth Environmental System Science, Pukyong National University, Busan, Republic of Korea, nypark@pukyong.ac.kr), Inseong Chang(Division of Earth Environmental System Science, Pukyong National University, Busan, Republic of Korea, dlstjd4000@pukyong.ac.kr), Jin Yong Choi(Coastal Disaster & Safety Research Department, Korea Institute of Ocean Science and Technology, Busan, Republic of Korea, dol76@kiost.ac.kr), Young Ho Kim(Division of Earth Environmental System Science, Pukyong National University, Busan, Republic of Korea, yhokim@pknu.ac.kr)