

On-demand development of bay-scale models using the Japanese Coastal Ocean Monitoring and Forecasting System

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We have developed the "Japanese Coastal Ocean Monitoring and Forecasting System" (MOVE/MRI.COM-JPN) to reproduce oceanic conditions across the coastal seas around Japan, based on an ocean model with horizontal resolution of approximately 2 km and a 4-dimensional variational data assimilation system. The Japan Meteorological Agency plans to use this system as a platform for various coastal marine operations, and details of the system are explained in Sakamoto et al. (2019) and Hirose et al. (2019) (submitted to *Ocean Dynamics*). However, the model resolution of 2 km is a minimum necessary requirement for continental shelf regions in contact with open oceans and relatively large inland seas such as the Seto Inland Sea, and it is a future task to provide information targeting bay-scale regions which are more closely related to society, including small bays, inland seas and straits. As a solution, a model covering the entire coastal seas around Japan with a resolution of several hundred meters is planned, but a current ordinary computer cannot perform its enormous calculations. In this respect, it seems feasible to deploy an array of bay-scale models of high resolution and small domain, which are nested from MOVE/MRI.COM-JPN, but management costs of a lot of models are concerned in that case. Therefore, we are considering an approach to develop bay-scale models on demand for a future expansion of MOVE/MRI.COM-JPN. As a first step towards this, we began developing a package that can quickly build a bay-scale model. Currently, the package consists mainly of three elements. The first is our numerical model MRI.COM. In addition to an offline-nesting function, it is possible to introduce dynamics important in coastal seas of Japan, such as river runoff, sea ice, tides and the inverse barometer effect. The second is a package of pre-processing and analysis tools named "MRI.COM eXperimental Environment". This helps a model developer to easily create model configurations such as topography data. The third is analysis data of the coastal seas around Japan produced by MOVE/MRI.COM-JPN. By using this data for the initial value and lateral boundary condition of a bay model, we can start a model experiment anytime after 2008. Using this package, we have created a Nagasaki Bay model with resolution of 100 m and an Osaka Bay model with resolution of 200 m. We reproduced seiches called "Abiki" by the Nagasaki Bay model, and the storm surge caused by Typhoon Jebi in September 2018 by the Osaka Bay model. The poster presentation will also show these results.

Keywords: coastal model, operational model, Japanese coastal seas, nesting, model development