A reanalysis of regional circulations in the Southern South China Sea using a HYCOM-ROMS downscaling ocean model

*Naru Takaura[1], Yusuke Uchiyama[1], Nizamani Zafarullah[2], Akihiko Nakayama[2]

1. Kobe Univ, 2. Tunku Abdul Rahman University

A high-resolution, high-precision downscaling oceanic circulation model for the Southern China Sea (SCS) was developed based on the Regional Oceanic Modeling System (ROMS) at a lateral resolution of 5 km, initialized and forced by the Hybrid Coordinate Ocean Model (HYCOM) global reanalysis product. A multi-year reanalysis was conducted for the four-year period from 2012 to 2015 with the HYCOM-ROMS system that properly accounts for wind stress and heat budget at surface, freshwater influences from the atmosphere and major rivers, and tidal variability.
The model results were confirmed to agree well with satellite and in situ measurement, and generally consistent with the findings in previous studies. For instance, prevailing strong meridional currents are provoked along the continental shelves between China and the southern Vietnam, which are driven by seasonally varying monsoons dominated in the winter and summer, followed by current separation to the east off the southern Vietnam occurred in summer.
Prospective applications of the system include assessments of oceanic dispersal of wastewater, quantification of marine ecosystem network, analyses of micro plastic transport, its coastal accumulation and maintenance of offshore structure. In the present study, we utilized the model outcome to evaluate external forcing conditions on offshore oil platforms along the coast of the Malay Peninsular and Borneo Island by using extreme value statistics for surface currents and wind. The maximum surface velocity was found to occur off the coast of Borneo Island, which is influenced by the Mindanao Current. It was suggested that water mass exchange between the Pacific and the SCS is extremely significant as it subsequently controls regional circulations in the coastal margins in the SCS.

Keywords: South China Sea, mass transport, HYCOM-ROMS, seasonal circulation

