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A medium-term reanalysis of synoptic circulations in the South China Sea using a HYCOM-ROMS downscaling ocean model

Naru Takaura¹, Yusuke Uchiyama¹, Nizamani Zafarullah², and Akihiko Nakayama²

¹ *Kobe University, Japan*, ² *Universiti Tunku Abdul Rahman, Malaysia*

(First author e-mail address: t.naru117@gmail.com)

Abstract

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 global reanalysis product (HYCOM+NCODA 1/12 deg.). 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 are generally consistent with the findings in previous studies.

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 currents were found off Borneo Island, which is influenced indirectly by the Mindanao Current remotely. 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.