Development of a regional ocean prediction model for the Southeast Asian Seas

The Southeast Asian seas span the global ocean's largest archipelago, the Maritime Continent (MC), which consists of islands with varying sizes and topography. It is characterized by rainfall (convection) variability by the atmosphere and ocean interaction across several spatial and temporal scales. The Southeast Asian seas provide a complex oceanic pathway connecting the Pacific and Indian Oceans and is significantly influenced by several large-scale atmospheric, oceanic, and coupled climate systems. However, due to the spatio-temporal complexity of the MC weather and climate variability, prediction of climate variability over the MC and its relationships to large-scale atmospheric circulation patterns remain a key challenge. To address this, we have developed an eddy-resolving regional ocean model covering the eastern Indian Ocean to the western Pacific (79°-160°E,16°S-24°N) for weather and climate studies. The ocean model used is based on the Nucleus for European Modelling of the Ocean (NEMO) framework with a horizontal resolution of 1/12° and 51 sigma layers. In this study, we investigate the regional and spatio-temporal variability of the Southeast Asian Seas thermohaline response during El Niño, La Niña and neutral years using the model output and available observations for the region. During El Niño, cooler sea water surrounding the MC affects rainfall and cyclone activity weaker than normal, and feedback to the physical processes i.e., thermohaline circulation in this region. We demonstrate the impacts of atmospheric forcing on the ocean model's ability to reproduce coherent patterns of the water structure and circulation.

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