Dynamical downscaling of global warming projections by an eddy-resolving OGCM

*山上 遥航[1]、鈴木 立郎[1]、建部 洋晶[1]
*Yoko Yamagami[1], Tatsuo Suzuki[1], Hiroaki Tatebe[1]

1. 海洋研究開発機構
1. Japan Agency for Marine-Earth Science and Technology

State-of-the-art climate models participating in the Coupled Model Intercomparison Project (CMIP) 6 show robust global mean sea level rise in the end of this century (IPCC AR6). However, since the majority of CMIP6 climate models have a horizontal resolution of about 1° in the ocean, climate simulations may be insufficient to assess sea level changes in the coastal region, where continental shelf waves, offshore currents and eddies affect coastal sea level variations. Therefore, in this study we perform a dynamic downscaling of a global warming projection in a climate model (MIROC6) using an eddy-resolving OGCM. We performed two sets of ensemble simulations to assess the impact of global warming. In a historical run, the OGCM was driven by the JRA55-do reanalysis for 1958-2019. In global warming runs, the OGCM was driven by the JRA-55-do forcing plus the climatologically anomalous surface forcing projected in MIROC6 for 2041-2060 and 2081-2100. We found that the historical run reduced the mean bias of sea surface temperature and dynamic sea level in the mid-latitude and Southern Ocean due to resolved western boundary currents and mesoscale eddies. Coastal Kelvin waves originating at the equator can propagate through the coastal wave guide in the Indian Ocean. It is suggested that eddy-resolving horizontal resolution is required to reproduce extreme sea level events along the northern Indian Ocean. Furthermore, the global warming run shows that the variance of seasonal sea level cycle in the South China Sea, Kuroshio and Gulf Stream regions are increased compared to those in the MIROC6

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