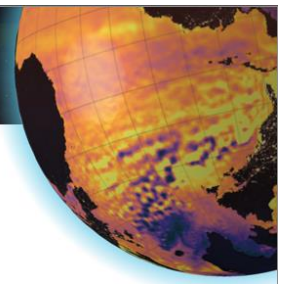

Regional Ocean-Atmosphere Coupled Modeling system for the entire North Pacific developed by the Korea Institute of Ocean Science & Technology

The complexity of the air-sea interactions poses a significant challenge in ocean and climate predictions. Feedbacks between the atmosphere and ocean, such as heat, moisture, and momentum exchanges across their interface, play crucial roles in ocean and climate variability. By integrating both atmosphere and ocean components within a unified framework, air-sea coupled models allow for more accurate representation of these interactions compared to single-component models. The North Pacific is characterized by a vigorous ocean-atmosphere interactions, emphasizing the importance of employing coupled models for improved ocean and climate predictions in the region. The regional ocean-atmosphere coupled modeling system has been developed to cover the entire North Pacific (5°S–70°N, 98°E–76°W). The ocean component is integrated using GFDL-MOM5 with a horizontal resolution of 1/12°×1/12° and 51 vertical levels using z-star coordinate system. The atmosphere component is based on WRF4-ARW with a horizontal resolution of 1/4°×1/4° and employs 51 hybrid vertical layers. The OASIS3-MCT coupler exchanges the heat, moisture, and momentum information between the ocean and atmosphere models hourly. A weakly coupled data assimilation system is implemented, incorporating ensemble optimal interpolation for the ocean component and cycling 3-dimensional variational method for the atmosphere component. The system regularly produced 14-day coupled prediction data for every Wednesday since June 2023. Preliminary prediction results until December 2023 have been validated in terms of ocean temperature and so on. The analysis highlights the need to address cold biases in sea surface temperature around the coasts of Korea. Future efforts will include resolving these modeling biases and generating high-resolution future climate change scenarios using the dynamical downscaling techniques based on this modeling framework.

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