EGU21-3826
https://doi.org/10.5194/egusphere-egu21-3826
EGU General Assembly 2021

Evaluation of FIO-ESM v1.0 Seasonal Prediction Skills Over the North Pacific

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Accurate prediction over the North Pacific, especially for the key parameter of sea surface temperature (SST), remains a challenge for short-term climate prediction. In this study, seasonal predicted skills of the First Institute of Oceanography Earth System Model version 1.0 (FIO-ESM v1.0) over the North Pacific were assessed. Ensemble adjustment Kalman filter (EAKF) and Projection Optimal Interpolation (Projection-OI) data assimilation schemes were used to provide initial conditions for FIO-ESM v1.0 hindcasts that were started from the first day of each month between 1993 and 2017. Evolution and spacial distribution of SST anomalies over the North Pacific were reasonably reproduced in EAKF and Projection-OI assimilation output. Two hindcast experiments show that the skill of FIO-ESM v1.0 with the EAKF data assimilation scheme to predict SST over the North Pacific is considerably higher than that with Projection-OI data assimilation for all lead times of 1–6 months, especially in the central North Pacific where the subsurface ocean temperature in the initial conditions is significantly improved by EAKF data assimilation. For the Kuroshio–Oyashio extension (KOE) region, the errors in the initial conditions have more rapid propagation resulting in large discrepancies between simulated and observed values, which are reduced by inducing surface waves into the climate model. Incorporation of realistic initial conditions and reasonable physical processes into the coupled model is essential to improving seasonal prediction skill. These results provide a solid basis for the development of operational seasonal prediction systems for the North Pacific.