An overview of seasonal to Decadal Predictions with MIROC6

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The study presents results of seasonal-to-decadal climate predictions based on a coupled climate model called the Model for Interdisciplinary Research on Climate version 6 (MIROC6) contributing to the Coupled Model Intercomparison Project Phase 6 (CMIP6). MIROC6 is initialized every year for 1960-2018 by assimilating observed ocean temperature and salinity anomalies and full-fields of sea-ice concentration, and by prescribing atmospheric initial states from reanalysis data. The impacts of updating system on prediction skill are then evaluated by comparing hindcast experiments between the MIROC6 prediction system and a previous system based on MIROC version 5 (MIROC5).
Skill of seasonal prediction is overall improved in association with representation of El Niño/Southern Oscillation (ENSO), the Quasi-Biennial Oscillation (QBO), and the Barents-Kara sea-ice concentration in MIROC6. In particular, the QBO is skillfully predicted up to 3 years ahead with a maximum anomaly correlation exceeding r=0.8. The prediction skill for the North Atlantic Oscillation in winter is also enhanced, but the prediction still suffers from model's inherent errors. On decadal timescales, MIROC6 has a predictive skill in the annual-mean sea surface temperature (SST) in the North Atlantic and the tropical Pacific. In particular, SST variability in the eastern tropical Pacific is predicted up to 7-10 years with a significantly larger skill score than the uninitialized experiment. MIROC6 hindcasts predict the Pacific regime shifts in the late-1970s and late-1990s better than MIROC5 hindcasts likely because of the improved skill of predicting interannual ENSO variability.

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