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Developing a new Predictive Ocean Atmosphere Model for Australia (POAMA-3.0)

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The Predictive Ocean Atmosphere Model for Australia (POAMA) is a state-of-the-art intra-seasonal to seasonal forecast system based on a coupled climate model and ocean/atmosphere/land observations assimilation system. Several versions of the POAMA system have been developed over the past decade, including 1.0, 1.5, 2.0 and 2.4. The development of a new POAMA system, POAMA-3.0, is currently underway. The model components in POAMA-3.0 are totally different from its previous versions. The POAMA-3.0 model is based on ACCESS-1.3 coupled model (Australian Community Climate and Earth-System Simulator) developed at the Centre for Australian Weather and Climate Research (CAWCR).
The ACCESS-1.3 model is comprised of the UK Met Office atmospheric model UM7.3, GFDL ocean model MOM4p1, Los Alamos sea ice model CICE4.1, the Australian land model CABLE1.8 and the CERFACS coupler OASIS3.25. The model configuration used for seasonal forecasting has some different configurations compared to the model used for the IPCC AR5 contributions in several aspects, such as an improved shortwave penetration scheme in the ocean model, enhanced entrainment and detrainment rates in deep convection, an improved cloud overlap scheme and better representation of the boundary layer in the atmospheric model. A 100-yr run is conducted and the model's biases and interannual variability are validated. At the current stage of POAMA-3.0 development, a simple data assimilation approach is applied to produce initial conditions for intra-seasonal/seasonal forecasts during the period of 1980-2010. The atmospheric model is nudged to ECMWF ERA-interim data and the ocean model is driven by the surface fluxes while the atmosphere is being nudged. Seasonal hindcasts are performed during the period 1982-2010 and each hindcast goes out to lead time of 5 months. The prediction skill for El Nino indices, Indian Ocean dipole, Madden-Julian Oscillation and Australian rainfall are evaluated. The retrospective results of POAMA-3.0 are encouraging. An advanced coupled data assimilation method based on ensemble Kalman filter will be applied in the next stage of development of the forecast system.