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Prediction of decadal variability of Sea Surface temperature by a coupled global climate model FGOALS_gl developed in LASG/IAP

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A decadal climate prediction is performed by a coupled global climate model FGOALS_gl developed in the State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics (LASG) at the Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences. Firstly, an Incremental Analysis Updates (IAU) scheme is applied to assimilate surface and subsurface ocean temperature and salinity fields derived from an oceanic objective analysis data for the initialization of the model ocean component. Started from the initialized states, hindcast integrations are performed with the specified historical solar cycle variations, concentrations of green house gas and sulphate aerosol, following standard 20C3M scenario used in the phase 3 of the Coupled Model Intercomparison Project (CMIP3). Based on the hindcast integrations, we perform forecast integrations under the radiative forcing of the A1B scenario in the CMIP3. Compared with the 20C3M run, the hindcast integrations have much higher skills in simulating the decadal variability of SST in the tropical central-eastern Pacific and mid-latitude northeastern Pacific, suggesting that the ocean initialization is able to enhance the model skill in the regions with large decadal variability. The forecast integrations suggest that the SST in the tropical central-eastern Pacific has reached its trough phase and will gradually increase in the following 10-15 years. Meanwhile, the global mean surface temperature predicted by the forecast integrations increases slower than that projected by the A1B scenario run over 2000-2010, but faster than the latter after that.