Model, data, experiment

The GEOS-5 AOGCM known as S2S-1.0 has been in service from June 2012 through January 2018 (Borovikov et al. 2017). The atmospheric component of S2S-1.0 is Fortuna-2.5, the same that was used for the Modern-Era Retrospective Analysis for Research and Applications (MERRA), but with adapted parameterization of moist processes and turbulence. The ocean component is the Modular Ocean Model version 4 (MOM4). The sea ice component is the Community Ice CodE, version 4 (CICE). The land surface model is a catchment-based hydrological model coupled to the multi-layer snow model. The AGCM uses a Cartesian grid with a 1° × 1.25° horizontal resolution and 72 hybrid vertical levels with the upper most level at 0.01 hPa. OGCM nominal resolution of the tripolar grid is 1/4°, with a meridional equatorial refinement to 1/4°. In the coupled model initialization, selected atmospheric variables are constrained with MERRA. The Goddard Earth Observation System integrated Ocean Data Assimilation System (GEOS-IODAS) is used for both ocean state and sea ice initialization. SST, T and S profiles and sea ice concentration were assimilated.

For 35 years, every 5 days, a 9-month coupled seasonal hindcast has been initialized. In this study we included 4 mid-month hindcasts, concurrent with the hindcasts for the new forecast system S2S-2.1 (in production mode since December 2017).

Tropical Pacific Ocean SST S2S-1.0 forecasts in 1982-1998 and 1999-2016

Fig. 1. Reynolds SST used as ODAS observations for the initialization of the seasonal hindcasts/forecasts, and as SST validation. SST, T and S profiles and sea ice concentration (GEOS-iODAS) is used for both ocean state and sea ice initialization. SST, T and S profiles and sea ice concentration were assimilated.

Seasonal cycle bias for Equatorial Pacific Ocean SST indices

Fig. 2. Spatial pattern of seasonal mean SST forecast departure from Reynolds SST for the 1982-1998 and 1999-2016 periods, averaged over all possible combinations of ensemble members. Potential predictability P computed as the anomaly correlation for a case of one of the ensemble members treated as observations, averaged over all possible combinations of ensemble members.%

References
