Supplementary Material

**ENSO hindcast skill of the IAP-DecPreS near-term climate prediction system: comparison of full-field and anomaly initialization**

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1. FGOALS-s2

FGOALS-s2 has five components: atmosphere, land, ocean, sea ice, and coupler. The atmospheric component is the Spectral Atmosphere Model of IAP LASG version 2 (SAMIL2), with a horizontal resolution of about 2.81° (longitude) × 1.66° (latitude) (Bao et al. 2013). The ocean component is the LASG IAP Climate system Ocean Model version 2 (LICOM2), with a horizontal resolution of about 1° × 1° in the extratropical zone and 0.5° × 0.5° in the tropics (Liu et al. 2012).

2. Initialization

The initialization of FGOALS-s2 is based on a newly developed assimilation scheme referred to as “ensemble optimal interpolation-incremental analysis update” (EnOI-IAU). The
assimilated observational oceanic temperature profiles are derived from the EN4.1.1 dataset collected by the Hadley Centre (Good, Martin, and Rayner, 2013).

The width of the assimilation cycle is one month. The EnOI-IAU scheme includes three major steps. The first step is “Forecast”, which generates the first guess of the assimilation cycle. The second step is “EnOI”, which calculates the analysis increment by combining the first guess with constructed observational data in the window (Oke et al. 2002). Here, the constructed observational data are the sums of the model climatology and observational anomalies. The third step is “IAU”, which incorporates the analysis increments in the upper 700 m to the model as small constant forcing terms of the prognostic equations in each integration step (Bloom et al. 1996). The outputs of the “IAU” were used in this study.

Two distinct initialization approaches—full-field and anomaly initialization—were applied. For the full-field initialization, raw records of the observational ocean temperature were assimilated. For the anomaly initialization, observational ocean temperature anomaly departure from climatological ocean temperature derived from the gridded EN4.1.1 objective analysis were assimilated.

References
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