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A multi-year climate prediction system based on CESM2

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Here we present a new seasonal-to-multiyear earth system prediction system which is based on the Community Earth System Model version 2 (CESM2) in 1° horizontal resolution. A 20-member ensemble of temperature and salinity anomaly assimilation runs serves as the initial condition for 5-year forecasts. Initialized on January 1st of every year, the CESM2 predictions exhibit only weak climate drift and coupling shocks, allowing us to identify sources of multiyear predictability. To differentiate the effects of external forcing and natural climate variability on longer-term predictability, we analyze anomalies calculated relative to the 50-member ensemble mean of the CESM2 large ensemble. In this presentation we will quantify the extent to which marine biogeochemical variables are constrained by physical conditions. This analysis provides crucial insights into error growth of phytoplankton and the resulting limitations for multiyear predictability.

Key words: CESM2, Predictability, Anomaly assimilation, Hindcast, Ocean biogeochemistry