

Two-year dynamical predictions of ENSO event duration during 1954–2015

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El Niño and La Niña events show a wide range of durations over the historical record. The predictability of event duration has remained largely unknown, although multiyear events could prolong their climate impacts. To explore the predictability of El Niño and La Niña event duration, multiyear ensemble forecasts are conducted with the Community Earth System Model, version 1 (CESM1). The 10–40-member forecasts are initialized with observed oceanic conditions on 1 March, 1 June, and 1 November of each year during 1954–2015; ensemble spread is created through slight perturbations to the atmospheric initial conditions. The CESM1 predicts the duration of individual El Niño and La Niña events with lead times ranging from 6 to 25 months. In particular, forecasts initialized in November, near the first peak of El Niño or La Niña, can skillfully predict whether the event continues through the second year with 1-yr lead time. The occurrence of multiyear La Niña events can be predicted even earlier with lead times up to 25 months, especially when they are preceded by strong El Niño. The predictability of event duration arises from initial thermocline depth anomalies in the equatorial Pacific, as well as sea surface temperature anomalies within and outside the tropical Pacific. The forecast error growth, on the other hand, originates mainly from atmospheric variability over the North Pacific in boreal winter. The high predictability of event duration indicates the potential for extending 12-month operational forecasts of El Niño and La Niña events by one additional year.