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Quantifying sources of subseasonal prediction skill in CESM2

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Subseasonal prediction fills the gap between weather forecasts and seasonal outlooks. There is evidence that predictability on subseasonal timescales comes from a combination of atmosphere, land, and ocean initial conditions. Predictability from the land is often attributed to slowly varying changes in soil moisture and snowpack, while predictability from the ocean is attributed to sources such as the El Niño Southern Oscillation. Here we use a unique set of subseasonal reforecast experiments with CESM2 to quantify the respective roles of atmosphere, land, and ocean initial conditions on subseasonal prediction skill over land. These reveal that the majority of prediction skill for global surface temperature in weeks 3-4 comes from the atmosphere, while ocean initial conditions become important after week 4, especially in the Tropics. In the CESM2 subseasonal prediction system, the land initial state does not contribute to surface temperature prediction skill in weeks 3-6 and climatological land conditions lead to higher skill, disagreeing with our current understanding. However, land-atmosphere coupling is important in week 1. Subseasonal precipitation prediction skill also comes primarily from the atmospheric initial condition, except for the Tropics, where after week 4 the ocean state is more important.