

Mid-latitude source of the ENSO-spread in SINTEX-F ensemble predictions

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The ensemble spread of seasonal prediction is investigated in this study to understand its role in the predictability of El Niño/Southern Oscillation (ENSO) based on the results of SINTEX-F2, a coupled ocean-atmosphere general circulation model. In SINTEX-F2 seasonal prediction system, first precursor based on the ENSO spread appears as a cyclonic wind anomaly over the central north Pacific in boreal winter (January). Then, warm-SST, positive-rainfall and cross-equatorial southerly wind anomalies appear over the northern hemisphere during the following spring (particularly in April). Such anomalies in April also accompany westerly wind anomaly in the western equatorial Pacific. Finally, El Niño-like conditions with warmer-SST and higher-rainfall become dominant in inter-member deviation after boreal summer. 500 hPa geopotential height suggests that stochastic atmospheric precursor (without oceanic signal) during winter causes El Niño-like spread through air-sea interaction. The oceanic response in the form of upper heat content (in the top 150m) appears as a result of equatorial wind forcing during boreal spring and summer. These results of seasonal precursor signals in SINTEX-F2 ENSO spread suggest that the seasonal footprinting mechanism (SFM) type air-sea coupling process is important for ENSO spread related to the “spring-barrier”. The state dependence of ENSO spread to background ensemble-mean state (particularly sensitivity of the SFM and California Niño in “post El Niño” phase) was also discussed.

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