Predicting El Nino Beyond 1-year Lead: Effect of Western Hemisphere Warm Pool

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Due to the profound impact of El Nino on global climate and weather, lots of investigations have been devoted to its prediction. However, the prediction skill based on observation is still insufficient and largely limited to less than one-year lead-time. Here, we demonstrate that Western Hemisphere warm pool (WHWP), the second largest warm pool in the world, plays a critical role in El Nino initiation so that El Nino prediction can be extended to 17-months. Sea surface temperature (SST) anomalies in WHWP in late summer contribute significantly to the emergence of the Pacific meridional mode (PMM) via air-sea interaction over subtropical North Pacific during subsequent winter and spring seasons. Near-equatorial surface wind anomalies associated with the PMM can further trigger El Nino through the dynamics of equatorial oceanic waves. Thus, this observational analysis reveals a clear step-by-step influence of WHWP on El Nino development with a 17-month lead.