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Role of the Indo-Pacific Interbasin Coupling in Predicting Asymmetric ENSO Transition and Duration

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Warm and cold phases of El Niño-Southern Oscillation (ENSO) exhibit a significant asymmetry in their transition/duration such that El Niño tends to shift rapidly to La Niña after the mature phase, while La Niña tends to persist for up to two years. The possible role of sea surface temperature (SST) anomalies in the Indian Ocean (IO) in this ENSO asymmetry is investigated using a coupled general circulation model (CGCM). Decoupled-IO experiments are conducted to assess asymmetric IO feedbacks to the ongoing ENSO evolution in the Pacific. Identical-twin forecast experiments show that a coupling of the IO extends the skillful prediction of the ENSO warm phase by about one year, which was about eight months in the absence of the IO coupling, in which a significant drop of the prediction skill around the boreal spring (known as spring barriers) is found. The effect of IO coupling on the predictability of the Pacific SST is significantly weaker in the decay phase of La Niña. Warm IO SST anomalies associated with El Niño enhance surface easterlies over the equatorial western Pacific and hence counteract the El Niño decay. However, this mechanism cannot be applied to cold IO SST anomalies during La Niña. The result of our CGCM experiments estimates that approximately one-half of the ENSO asymmetry arises from the phase-dependent nature of the Indo-Pacific interbasin coupling.