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# Dynamical Processes of the Impact of Indian Summer Monsoon on ENSO: Observation, Model Simulation and Future Change

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A weak Indian summer monsoon (ISM) strengthens an El Niño via generating a cyclonic circulation over the northwestern Pacific. The westerly anomaly on the southern flank of this cyclone generates eastward anomaly in the mixed layer, induces warm zonal advection, and excites oceanic downwelling Kelvin waves, deepening the thermocline in equatorial eastern Pacific and resulting in cold vertical advection. The influence of monsoon-induced Pacific wind anomaly on ENSO is mainly achieved by changing the zonal advective feedback and thermocline feedback. CMIP6 models show a large diversity for the impact of ISM on ENSO, related to the diverse amplitudes of ISM among the models. Models simulating a stronger ISM display more robust features of ISM-induced anomalous circulation over the northwestern Pacific, and the larger equatorial wind anomalies on the south flank of the anomalous circulation affect ENSO evolution more significantly by causing stronger ocean-atmosphere coupling processes.

The future changes in the ISM's impacts on ENSO also exhibit a large spread among the CMIP6 models. The uncertainty in the projections is linked to the diverse changes in the response of anomalous circulation over the northwestern Pacific to ISM. The models showing an increased (decreased) sensitivity of anomalous circulation over the northwestern Pacific to ISM simulate enhanced (weakened) ISM's impacts on ENSO under global warming, even though the amplitudes of ISM remain unchanged