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Processes in the Pacific La Niña onset triggered by the Atlantic Niño

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Previous observational and model studies have shown that a warm (cold) event in the equatorial Atlantic during the boreal summer are related to the development of a Pacific La Niña (El Niño) event, that is fully developed in the following winter. Although the connection takes place via atmospheric bridge, the processes at work have not been clarified for such a remote and lagged relationship. The present study uses a partially coupled atmosphere–ocean model to infer a mechanism by which a Pacific El Niño event can be developed. In this way, enhanced equatorial convection in the equatorial Atlantic during a warm event results in enhanced subsidence and surface wind divergence over the equatorial Pacific around the dateline. This wind anomaly contributes to pile up water in the western equatorial Pacific, triggering a perturbation in the depth of the oceanic thermocline, which propagates eastward as an equatorial Kelvin wave from autumn to winter. The thermocline shallowing as the wave propagates allows for cooling of the oceanic mixed layer through anomalous temperature advection by anomalous zonal currents and by mean vertical entrainment velocity. Zonal advective and thermocline feedbacks reinforce the surface winds anomalies over the central eastern equatorial Pacific setting up the conditions for the development of a cold event in this ocean. The sequence during an Atlantic cold event is similar with the appropriate change in signs. These findings are relevant to ENSO predictability at seasonal timescales.