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Topic: Recent ocean salinity science advances

Title: What atmospheric forcings cause the eastward extension of the western-Pacific fresh pool during El Nino?

Abstract: The fresh pool in the western tropical Pacific Ocean, characterized by low salinity, extends eastward during El Nino. This eastward extension is important to El Nino-Southern Oscillation (ENSO) cycle because it amplifies ocean-surface warming that triggers atmospheric convection, thereby providing feedback to the trade winds that drive the ocean currents. Sea surface salinity data from in-situ sensors and satellites have well characterized the eastward extension of the fresh pool. While some studies concluded that zonal advection by the wind-driven, eastward surface current anomalies during El Nino are important for the eastward extension of the fresh pool, other studies suggested that precipitation anomalies due to the eastward-moving, atmospheric convection center are also important. The relative importance of wind and precipitation anomalies in the fresh-pool extension during El Nino remain inconclusive. Here, we use observationally constrained ECCO (https://ecco.jpl.nasa.gov) ocean state estimation and the associated forward model forcing sensitivity experiments to isolate the effects of wind and precipitation-evaporation forcings on the fresh-pool extension. We found that (1) wind anomalies are essential for the fresh-pool extension during the onset of El Nino; (2) precipitation-evaporation anomalies become important only during the mature and decay phases of El Nino, with an impact that is smaller than that of wind anomalies during the onset of El Nino. The presentation also interprets these findings in the context of the coupled ocean-atmosphere dynamics associated with ENSO.

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