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Wintertime meridional teleconnection associated with convective activity over the tropical Northwestern Pacific

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Tropical climate variability and associated meridional teleconnections are major origins of seasonal predictability. Statistically, it has been known that El Nino (La Nina) brings warmer (colder) winter to Japan, providing a basis for winter seasonal predictions. However, few studies examined structure and mechanisms for that tropical-extratropical teleconnection. In this study, we investigate the remote influence of wintertime convective activity over the tropical Northwestern Pacific on the atmospheric circulation in the extratropical Northern Hemisphere, by analyzing monthly observational data sets and an ensemble AMIP experiment for 1979-2012.

Convective activity over the tropical Northwestern Pacific is significantly correlated with El Nino-Southern Oscillation (ENSO), and our regression analysis shows that enhanced (suppressed) convection around the Philippines is associated with cold (warm) winter around Japan, which is consistent with the empirical relationship of ENSO. However, ENSO explains only half of the variance of the total convective activity around the Philippines, suggestive of a large contribution from atmospheric internal variability. We isolate the latter component by subtracting linear regression against an ENSO index from the observed anomalies and as inter-member variability in the ensemble AMIP experiment. Circulation anomaly patterns differ considerably between the ENSO-forced and internal components both in the observations and model, and the internal variability is more influential on the wintertime East Asian weather. Our analysis thus suggests that the atmospheric internal variability around the Philippines significantly limits the wintertime seasonal predictability in East Asia that arises from ENSO.

Keywords: ENSO, East Asian winter monsoon, seasonal predictability