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A newly discovered inter-hemispheric teleconnection increases predictability of precipitation extremes in southwestern US

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Early and reliable prediction of seasonal precipitation in the southwestern US (SWUS) remains a challenge with significant implications for the economy, water security and ecosystem management of the region. Traditional drivers of winter precipitation in the SWUS have been linked to the El Niño-Southern Oscillation (ENSO), decadal oscillations of the sea surface temperature in northern Pacific and Atlantic oceans, and persistent high-pressure ridges over the Gulf of Alaska. However, ENSO as well as other climate modes exhibit weak statistical correlation with precipitation and low predictability as lead time increases.
Grounded on the hypothesis that still undiscovered relationships between large-scale atmosphere-ocean dynamics and SWUS precipitation might exist, here we follow a diagnostic approach by which instead of restricting ourselves to the established teleconnections, we analyze the correlation of global sea surface temperature (SST) and geopotential height (GPH) with winter precipitation amounts in all climatic divisions in the SWUS, for 1950-2015. Results show that late-summer persistent SST and GPH anomalies in the southwestern Pacific are strongly connected with winter precipitation in most climatic divisions, exhibiting higher correlation values than ENSO, and thus increasing the potential for earlier and more reliable precipitation prediction. Cross validation and 30-year running average analysis starting in 1950 suggest an amplification of the detected teleconnections over the past three to four decades. The latter is most likely a result of the reported expansion of the tropics, which has started after the 1980s. Our work highlights the need to understand the dynamic nature of the coupled atmosphere-ocean system in a changing climate for improving future predictions of regional precipitation.