

Westward Wind Changes over the Tropical and Mid-latitude Pacific in the Past Three Decades Driven by the Inter-basin Teleconnections

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Due to its active role in the atmosphere-ocean interactions and in the global climate variability, the trade wind regime over the Pacific Ocean has been receiving increased attention. Although the intensification of the equatorial trade wind in recent decades has been widely investigated, the meridional extension of this easterly wind change and the associated mechanism remain unclear. To untangle this problem, we combine observations, reanalysis datasets, and a hierarchy of climate model simulations. Analysis based on measurements and reanalysis datasets show that the intensified easterly wind anomaly is not only confined within the tropical basin, but also extends to the mid-latitude Pacific, from 40°S to 40°N. In the tropics, the trade wind change is primarily attributed to the enhanced Walker circulation driven by the inter-basin teleconnection and further the decadal variability over the Atlantic and the Pacific oceans, whereas in the mid-latitudes, the changes in sub-tropical highs and Aleutian Low become more dominant. While the altered winds can contribute to the observed sea surface temperature (SST) changes in both tropical and mid-latitude Pacific, they are not driven by the regional Pacific SST changes. Instead, the wind changes are mostly caused by remote influences originated from the tropical Atlantic and Indian Ocean SST changes through stationary Rossby waves. This finding builds a direct pathway linking the tropical Atlantic and Indian Ocean to the mid-latitude Pacific. This pathway has a broad implication for understanding air-sea interactions and sea level changes over the Pacific, and may have an important impact on the interannual and decadal predictability of the Pacific climate variability, such as Pacific Decadal Oscillation and El Niño –Southern Oscillation.

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