

Variations of Mid-Oceanic Troughs and Associated Atmospheric Teleconnection Patterns: Roles of Tropical SST and Arctic Sea Ice

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The mid-Pacific trough (MPT), occurring in the upper troposphere during boreal summer, acts as an atmospheric bridge connecting the climate over Asia, the Pacific, and North America. The first (second) EOF mode of the MPT reflects a change in its intensity on the western (eastern) portion of the trough. Both modes are significantly correlated with the variability of tropical Pacific SST. Moreover, the first mode is affected by the Atlantic SST and the second mode is influenced by the Arctic sea ice near the Bering Strait.

A stronger MPT shown in the first mode is significantly linked to drier and warmer conditions in the Yangtze-River basin, southern Japan and northern U.S. and a wetter condition in South Asia and northern China, while a stronger MPT shown in the second mode is associated with drier and warmer southwestern U.S. The relationships between MPT and the climate over Asia (North America) are modulated by ENSO (Atlantic SST and Arctic sea ice). Moreover, the dominant modes of MPT are closely related to Pacific tropical cyclone (TC) genesis during summer. Overall, an intensified MPT corresponds to more TCs over the western North Pacific and less TCs over the eastern Pacific.

A nearly parallel analysis has also been applied to the variations of the mid-Atlantic trough and associated teleconnection.

Keywords: Mid-Pacific trough, Atmospheric teleconnection, Tropical SST and Arctic sea ice