

Interdecadal Variability of the ENSO–North Pacific Atmospheric Circulation in Winter

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The interdecadal change in the relationship between the El Niño–Southern Oscillation (ENSO) and atmospheric circulation over the North Pacific is investigated using both observational data and an atmospheric general circulation model. There are two prominent modes of winter mid-latitude atmospheric variability in the North Pacific: the West Pacific (WP) teleconnection and the Aleutian Low (AL). The relationship between ENSO and the WP-AL patterns changed notably around the late 1970s. From 1957 to 1975, during the mature phase of ENSO, significant sea surface temperature anomalies (SSTAs) occurred, mainly in the equatorial eastern Pacific Ocean; the associated atmospheric circulation anomaly pattern resembles the negative phase of a WP teleconnection pattern. In contrast, for the 1978–2011 period, significant negative SSTAs were observed in the western and extratropical Pacific in both hemispheres, with some significant positive SSTAs appearing over the eastern Pacific. This is in agreement with the defined regions of a mega-ENSO, the associated atmospheric circulation anomaly pattern resembles the AL mode. Further analysis suggests that a negative–positive anomaly pattern in the 500 hPa geopotential height throughout the entire North Pacific, possibly enhanced by the SSTAs in the extratropical North Pacific associated with the mature phase of ENSO, is responsible for modulating the relationship between ENSO and the North Pacific atmospheric circulation.