



Connection between weak stratospheric vortex events and the Pacific Decadal Oscillation

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The possible effect of the Pacific Decadal Oscillation (PDO) on the morphology of weak stratospheric vortex (WSV) events in the Northern Hemisphere winter is examined by analyzing long-term reanalysis data. The WSV events, which are defined when negative polar-cap geopotential height anomalies at 50 hPa fall below their wintertime 10th percentile, are found to occur more frequently during the positive phase of the PDO (+PDO) than during the negative phase (-PDO). More importantly, during +PDO, vortex displacement events are more popular. This contrasts with -PDO during which vortex split events are more common. This difference is closely linked to the difference in wave forcing. It is found that while +PDO WSV events are primarily driven by wavenumber-one forcing with rather minor contribution of wavenumber-two forcing, -PDO WSV events are mainly driven by wavenumber-two forcing.

This difference in wave driving partly results from the PDO-related tropospheric circulation anomalies over the North Pacific. In terms of linear interference argument, wavenumber-one component of +PDO-related anomalies constructively interferes with climatological waves. However, destructively interference is found for -PDO-related anomalies. The enhanced wavenumber-two forcing during -PDO is likely caused by the enhanced low-frequency variability over the Alaska that results from the poleward shift of the Pacific jet in response to -PDO.