

The western Pacific pattern bridging stratospheric sudden warming and ENSO

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Previous studies show that the stratospheric sudden warmings (SSWs) are closely linked to the low height anomalies (LHAs) over the North Pacific and the presence of the LHAs is independent of the phases of the El Niño-Southern Oscillation (ENSO). Based on the wintertime daily reanalysis data from 1958 to 2013, this study demonstrates that most of the LHAs which are linked to SSWs are the footprints left by the western Pacific patterns (WPs), few of them by the Pacific-North American patterns (PNAs), or by mixed WP-PNA patterns. This study also demonstrates that the WPs' LHAs, and therefore the SSWs, are strongly modulated by ENSO and the modulation effects changed over 1958-2013: before 1980, the WPs' LHAs have stronger intensity and longer duration in El Niño winters (EN) than La Niña winters (LN) and ENSO neutral winters (ENSON), and the SSWs occur twice as often during EN, compared to LN and ENSON. After 1980, the WPs' LHAs have stronger intensity in EN and larger frequency during LN than ENSON. Consistently, the SSWs occur nearly twice as often during both EN and LN for this period, compared to ENSON.