



Formation mechanisms and climate impacts of the western Pacific pattern and the ENSO modulation

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The western Pacific (WP) pattern is a major teleconnection pattern that influences the wintertime Northern Hemisphere climate variations. Based on daily NCEP/NCAR reanalysis data, this study examines the formation mechanisms and climate impacts of the WP pattern, and the El Niño-Southern Oscillation (ENSO) modulation. The result shows that the WP pattern may arise from a quadrupole-like disturbance over Asia and North Pacific, or from the Pacific-North American (PNA) pattern of the same polarity as or opposite polarity to that of the WP pattern. Amongst the three types of WP, the WP pattern, which converts from the PNA pattern of the same polarity, is most influential on North America near surface and polar stratospheric air temperatures. Furthermore, for this type of the WP pattern, this study demonstrates that ENSO is influential in determining which phase of the WP pattern is likely to be triggered. The positive WP pattern occurs more frequently during El Niño than during La Niña, and vice versa for the negative WP pattern. In addition, the results reveal an ENSO modulation of the amplitude and the duration of this type of the WP pattern. The positive WP pattern has larger amplitude and longer duration in El Niño than in La Niña, while the negative WP pattern has smaller amplitude and shorter duration in El Niño than in La Niña and neutral ENSO. The above findings suggest that the PNA pattern plays a crucial role in the formation mechanisms and climate impacts of the WP pattern and ENSO-WP relation.