

The interdecadal change of ENSO impact on wintertime East Asian climate

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The interdecadal change of the relationship between the winter mean surface air temperature (SAT) over East Asia (EA) and El Nino-Southern Oscillation (ENSO) is investigated using both observational data and a simple general circulation model. A positive phase of the first empirical orthogonal function (EOF) mode of the SAT (SAT-EOF1) over EA is characterized by significant warming over the mid- to high-latitude EA and is linked to the Arctic Oscillation (AO). The second EOF mode (SAT-EOF2) is represented by a significant cooling extending from 55°N to the tropics and an abnormal warming over the high-latitude EA. Focus is given to SAT-EOF2 which has a close relationship to a La Nina type sea surface temperature (SST) anomalies. A clear climate shift of SAT-EOF2 is observed in the mid-1980s. The relationship between SAT-EOF2 and ENSO in two subperiods, i.e., 1957 to 1982 (P1) and 1986 to 2010 (P2), are discussed and compared. Results show that the relationship between SAT-EOF2 and ENSO is significantly increased after mid-1980s. This is due to stronger SST and precipitation anomalies in the tropical western Pacific associated with ENSO in P2 than in P1. In the mid-latitudes, the Pacific-North American (PNA) teleconnection pattern is more closely related to ENSO in P2, while in P1 the ENSO-related atmospheric circulation anomalies are more similar to a zonally orientated teleconnection pattern. Numerical experiments suggest that the difference in the ENSO-related circulation anomaly in the mid-latitudes is likely related to the difference in climatological mean flow of these two periods.

Key words: ENSO, winter climate, East Asia.