

Interdecadal change of the northward propagating ISO in the East Asian summer monsoon subsystem

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The East Asian monsoon subsystem has the northward propagating intraseasonal oscillation (NPISO) which is modulated with ENSO phase. The present study aims to investigate the NPISO activity and its interdecadal change over East Asian subsystem as well as its ENSO modulation. The NPISO is significantly affected by the westward expanded anticyclonic circulation over western North Pacific (WNP) which is often referred as the WNP subtropical high (WNPSH). The WNPSH is enhanced by the Gill-type Rossby wave response due to the reduced convection, and eventually, acts as a bridge in connecting the tropics to the extratropics through the associated circulation. In addition, it is found that the NPISO is significantly affected by the eastern Pacific (EP) warming, the western Pacific (WP) cooling, and the Indian Ocean (IO) warming in the preceding winter. In particular, the IO SST warming plays an important role in connecting the NPISO with El Niño/Southern Oscillation (ENSO). Consequently, the summertime NPISO in this regional subsystem is related to the IO SST warming, the WNP convection, and the WNPSH through the atmospheric bridge process. On the interdecadal change in the NPISO, a strong dynamical link between NPISO and ENSO exists during the late summertime (i.e., July to August) after the late 1970s, while it does during the early summer (i.e., May and June) before the late 1970s. Before the late 1970s, the early summer NPISO is modulated by the springtime IO SST warming and the suppressed convection over the central North Pacific, and consequently, related to the ENSO-induced WP pattern from the winter to the following spring. However, after the late 1970s, because of an enhanced Walker-Hadley circulation, the IO SST warming is maintained until the concurrent summer season, which promotes a strong suppressed convection anomaly over the Philippine Sea during summer and consequently the enhanced WNPSH and the Pacific-Japan (PJ) pattern.