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Modulation of PDO on relationship of the East Asian Summer Monsoon and ENSO

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Relationship of East Asian Summer Monsoon (EASM) and ENSO experiences an obvious interdecadal change around mid-1970s (epoch 1949 - 1977 vs. epoch 1978 - 1998), which is consistent with the transition of PDO phase from cold to warm. PDO is regarded as the major modulation factor on the relationship of EASM and ENSO through two pathways in this study. One pathway is the interdecadal change of basic atmosphere state, which features significant "South Flood North Drought" in China, reduced EASM over East Asia in PDO warm phase, and both the diabatic cooling over the central-western tropical Pacific and the diabatic heating over the eastern tropical Indian ocean and maritime continent are responsible for it. PDO-related diabatic heating forced 20-year numerical experiments confirm its capability to reproduce the observed interdecadal change of atmosphere basic state. 2-year composite El Nino SST anomaly (composite of all the El Nino events in this study, 1957/58, 1965/66, 1972/73, 1976/77, 1982/83, 1986/87, 1991/92, 1997/98) together with the fixed PDO-related diabatic heating are prescribed in the atmosphere general circulation model (CCM3), in order to demonstrate how the PDO-caused atmosphere basic state modulates the relationship between EASM and ENSO. The experiment results show that the anomalous western Pacific anticyclone in El Nino decaying summer can be greatly intensified in PDO warm phase in terms of this pathway. The other pathway is the interdecadal change of ENSO behavior, which characterizes larger positive SST anomaly in both the eastern tropical Pacific and the Indian ocean during El Nino maturing and decaying stages in PDO warm phase. Composite El Nino SST anomalies for the two types of El Nino events in PDO cold and warm phases are constructed and prescribed in CCM3, respectively, so as to distinguish their influences. We find out that change of El Nino behavior has uniform influence on the anomalous western Pacific anticyclone as the PDO-caused atmosphere basic state, and among which, convection anomaly over the central-western Pacific make the major contribution. In summary, it is the western Pacific anticyclone that PDO mainly employs to modulate the relationship between EASM and ENSO.