

Characteristics of East Asian monsoon cycle represented by the western Pacific-Indian Ocean regional low-level circulation types and the relationship with ENSO

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Abstract

The East Asian monsoon cycle is identified by the western Pacific-Indian Ocean regional low-level circulation weather types (WTs) of daily 850hPa winds from 1979 to 2024 based on the ERA5 data. The intensity of the East Asian summer and winter monsoons are well represented by different kinds of WT evolution. Nine low-level circulation types were identified. We found that a strong (weak) winter monsoon tends to follow a strong (weak) summer monsoon. The in-phase relationship between the summer and winter monsoon is driven by the ENSO. A strong (weak) summer monsoon tends to occur during an La Niña (El Niño) developing year. The winter monsoon is strong (weak) during La Niña (El Niño) winters. However, a strong or weak summer monsoon has no clear relationship with its preceding winter monsoon. Anomaly anticyclone circulation (strong summer monsoon) over the SCS and PHS associated with the strong SST anomalies are observed during La Niña developing summers, which represents a summer monsoon condition. When the strong SST anomalies move eastward along with the La Niña, the SCS is cover by strong cyclone circulation (strong winter monsoon).

Key words: East Asian monsoon, low-level circulation weather types, ENSO