



Distinguishing interannual variations of the northern and southern components of the East Asian winter monsoon

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The East Asian winter monsoon (EAWM) related climate anomalies have shown large year-to-year variations in both the intensity and the meridional extent. The present study distinguishes the interannual variations of the low-latitude and mid-high-latitude components of the EAWM to gain a better understanding of the characteristics and factors of the EAWM variability. Through composite analysis based on two indices representing the northern and southern components of the EAWM variability, the present study clearly reveals features unique to the northern and southern components. The northern component is associated with changes in the mid-high-latitude circulation systems, including the Siberian high, the Aleutian low, the East Asian trough, and the East Asian westerly jet stream, whereas the southern component is closely related to circulation changes over the global tropics, the North Atlantic, and the North America. A strong northern component is accompanied by positive, negative, and positive surface temperature anomalies in the Indochina Peninsula, mid-latitude Asia, and northeast Russia. A strong southern component features lower temperature over tropics and higher temperature over mid-high-latitude Asia. On the interannual time scale, the northern component is significantly associated with both western and eastern autumn Arctic sea ice concentration (SIC) anomalies, while the southern component is closely related to El Niño-Southern Oscillation. The North Atlantic Oscillation and the Arctic Oscillation do not have an obvious influence on both two components. The processes connecting autumn Arctic SIC anomalies to winter Asian circulation and temperature anomalies include anomalous pressure pattern around the Arctic through thermodynamic effect of Arctic SIC anomalies in autumn and downstream extension of circulation anomalies to Asia via wave activity propagation in winter.