

Remote influence of the interannual variability of the Australian summer monsoon on wintertime climate in East Asia and the western North Pacific

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In northern Australia, mean rainfall during the Australian summer monsoon (AUSM) season exhibits distinct interannual variability, which is unlikely forced by sea surface temperature anomalies but essentially a manifestation of the internal variability of the AUSM system. This study reveals its significant remote influence on wintertime climate in East Asia and the western North Pacific. The stronger AUSM excites a positive Western Pacific (WP) pattern with strengthening of the East Asian winter monsoon, leading to a colder winter over the Korean Peninsula and western Japan as well as reduced precipitation over southern China. Meanwhile, the Okhotsk sea-ice extent tends to decrease under warm anomalies and weakened offshore winds.

The mechanisms for this cross-equatorial teleconnection are investigated based on observational data and numerical experiments. The WP-like circulation anomalies are excited by the propagation of stationary Rossby waves generated by upper-level divergent wind anomalies from the Southern Hemisphere that extends into the Asian jet. The climatological Hadley cell has an essential role in this process. Anomalous diabatic heating over East Asia and feedback forcing by transient eddies along the Pacific stormtrack act to further amplify the WP-like response.