Impacts of the super El Niño events on the probability of spring-summer extreme precipitation in eastern China

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Features and mechanism of the probability changes of spring and summer extreme precipitation during the Super El Niño events were investigated, based on the 0.5°×0.5° resolution China daily precipitation data from the National Meteorological Information Center. Through analyzing the water vapor transport and vertical motion characteristics contributed from the Super El Niño and its derived mode respectively, mechanism of Super El Niño impacts on extreme precipitation over eastern China were discussed. The results show during the decaying phase of Super El Niño events, the occurrence probability of spring extreme precipitation increases significantly over the whole eastern China, especially on the north of Yangtze-Huai River Valley. In summer, over Yangtze River Valley, the probability is nearly doubled from that in regular years, while it decreases sharply over southern and northern China. Physical analysis indicates that in spring, the Super El Niño and its derived combination mode (C-mode) through nonlinearly interacting with the tropical Pacific annual cycle, both have significant effects on the anomalous circulation background; i.e., the strong anti-cyclonic circulation anomalies over Northwestern Pacific provides abundant moisture conditions and ascending trend over eastern China, which is conductive to occurrence of the observed extreme precipitation over there. To the following summer, the Super El Niño event has been terminated, while the anomalous Northwest Pacific anti-cyclonic circulation associated with the C-mode still exists, and the Yangtze River Valley maintains the favorable conditions for extreme precipitation. Additionally, in spring and summer, daily meridional wind activity in the mid-upper troposphere over eastern China is exceptionally active during the Super El Niño events, and the frequent meridional confluences between the southward cold air and northward warm moisture could lead to enhanced convective events, which may also contribute to the increased occurrence of extreme precipitation.

Key words: Super El Niño event, Extreme precipitation, ENSO derived mode, C-mode, Eastern China