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Influence of the preceding winter Northern Hemisphere annular mode on the spring extreme low temperature events in the north of eastern China

S. Yin (1,2), J. Feng (1), and J. Li (1)

(1) Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China, (2) Graduate University of Chinese Academy of Sciences, Beijing, China

The relationship between the preceding boreal winter Northern Hemisphere annular mode (NAM) and the spring extreme low temperature events in the north of eastern China during 1959-2008 was examined in this study. The results show that there exists a significantly negative relationship between the preceding winter (December-March) NAM and the following spring (March-May) extreme low temperature events in the north of eastern China. When the preceding winter NAM is strong, in the following spring negative (positive) geopotential height anomalies occur in the upper (lower) levels over the north of eastern China, and anomalous sinking motion and vertical heating are accompanied in the same area and cold vortex over Northeast China would be weak, resulting in less extreme low temperature events. The opposite circulation patterns in the spring are obviously observed in weak preceding winter NAM years. Furthermore, the possible physical mechanism associated with impact of the preceding winter NAM on the subsequent spring extreme low temperature events in the north of eastern China is explored. The results indicate that the Eurasian snow cover is a potential bridge connecting the signals in winter NAM and spring extreme low temperature events in the north of eastern China. When the preceding winter NAM is strong (weak), mid-high latitudes of Eurasia are warmer (colder) and Eurasian snow extent is smaller (larger) than normal. Besides, Eurasian snow extent anomalies in the preceding winter can strongly persist to the following spring. That is when the preceding winter Eurasian snow extent is small, accordingly in the following spring cold vortex over Northeast China would be weak and the surface air temperature in the north of eastern China is high, resulting in less extreme low temperature events, and vice verse. Therefore, the preceding winter NAM contributes to the frequency and strength of the following spring extreme low temperature in the north of eastern China, yielding a potential valuable signal in predicting the spring extreme low temperature events in the above-mentioned region.