



Intra-seasonal Characteristics of Wintertime Extreme Cold Events over South Korea

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The present study reveals the changes in the characteristics of extreme cold events over South Korea for boreal winter (November to March) in terms of the intra-seasonal variability of frequency, duration, and atmospheric circulation pattern. Influences of large-scale variabilities such as the Siberian High activity, the Arctic Oscillation (AO), and the Madden-Julian Oscillation (MJO) on extreme cold events are also investigated. In the early and the late of the winter during November and March, the upper-tropospheric wave-train for a life-cycle of the extreme cold events tends to pass quickly over East Asia. In addition, compared with the other months, the intensity of the Siberian High is weaker and the occurrences of strong negative AO are less frequent. It lead to events with weak amplitude and short duration. On the other hand, the amplified Siberian High and the strong negative AO occur more frequently in the mid of the winter from December to February. The extreme cold events are mainly characterized by a well-organized anticyclonic blocking around the Ural Mountain and the Subarctic. These large-scale circulation makes the extreme cold events for the midwinter last long with strong amplitude. The MJO phases 2–3 which provide a suitable condition for the amplification of extreme cold events occur frequently for November to January when the frequencies are more than twice those for February and March. While the extreme cold events during March have the least frequency, the weakest amplitude, and the shortest duration due to weak impacts of the abovementioned factors, the strong activities of the factors for January force the extreme cold events to be the most frequent, the strongest, and the longest among the boreal winter.

Keywords extreme cold event, wave-train, blocking, Siberian High, AO, MJO