

Recent Changes in Pressure Patterns and Their Regional Occurrence at Times of Heavy Snowfall and Blizzard Events in Hokkaido, Japan

SUMMARY

The Japanese archipelago extends a great distance from north to south. Hokkaido is northernmost island of Japan. In typical winter, seasonal winds from Siberia pick up moisture when they pass over the Japan Sea, then they bring great amounts of snow to the Japan Sea side of Hokkaido. Conversely, dry winds blowing in Eastern Hokkaido result in little snowfall.

Recently, heavy snowfall and severe blowing snow events have occurred in Eastern Hokkaido. In January 2004, record-breaking snowfall hit Abashiri Region in Eastern Hokkaido. In March 2013, a snowstorm of unprecedented severity hit eastern Hokkaido, and nine people died in blizzards. These cases suggest that the winter weather may be changing. So, we studied the recent changes in the regional occurrence of heavy snowfall and severe blowing snow events in Hokkaido.

Analyzing the data of surface weather observation stations, 87 heavy snowfall and severe blowing snow events are extracted for the winters from 1984/85 to 2014/15 in Hokkaido. The locations and routes of low-pressure systems before they passed near Japan were classified into 17 patterns, and the typical winter pressure distributions after they passed Japan were classified into three patterns.

With regard to the characteristics of charted weather patterns at the time of heavy snowfall and severe blowing snow events in recent years in Hokkaido, it was found that the number of heavy snowfall and severe blowing snow resulting from a pattern in which one of two low-pressure areas is absorbed by the other rapidly increased during the period from 2005/06 to 2014/15, compared with the periods before that. In this pattern, heavy snowfall and severe blowing snow events likely to occur in Abashiri and Kushiro Regions of Eastern Hokkaido.

We also found that the lowest pressures of the low-pressure systems declined over the course of the 31 winters. On December 17, 2014, the pressure of the low-pressure system was 948 hPa. This was the lowest recorded pressure for any of the 31 winters. The pressure system passed over Hokkaido and developed a pressure of 58 hPa in 24 hours. The blizzard caused closures on 28 sections of 15 national highways and on 181 sections of 144 prefectural roads in Eastern Hokkaido.

In Eastern Hokkaido, the occurrence rate of heavy snowfalls and severe blowing snow is low among typical winter pressure distributions; however, it is considered that the occurrence frequency of heavy snowfall and severe blowing snow is likely to increase in the future.