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Synoptic climatological study on the decrease in heavy snowfall days in Hokuriku District of Central Japan after the latter half of 1980s

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Many reports point out that the total snowfall amount in winter in the Japan Sea side of the Japan Islands, such as Hokuriku District, decreased considerably after the latter half of 1980s, in coincidence with the Global Warming together with the interdecadal variation. As for around December, this seems to be partly because more precipitation in the winter monsoon situation is brought as rainfall (not as snowfall), due to the warmer temperature than before. On the other hand, contribution of the daily heavy snowfall events there would be also important for mid-winter when the air temperature is the lowest in a year. Thus the present study examined the contribution of the heavy snowfall events to the difference of the total snowfall amount before and after the middle of 1980s, based on the daily data at several operational surface observation stations of JMA in the Hokuriku District for 1971 - 2001. Then the related daily atmospheric fields were analyzed climatologically with use of the NCEP/NCAR re-analysis data with every 2.5 degrees latitude/longitude interval.

In the former half of the analysis period, the larger total snowfall amount in January in the Hokuriku District, such as at Takada, was greatly contributed to by the heavy snowfall events with more than 30 cm/day (referred to as “heavy snowfall day”, hereafter). The decrease in the total amount in the latter half of that period was due to that in the contribution of “heavy snowfall days”. Furthermore, the “heavy snowfall days” tended to appear in the persistent snowfall episodes (including also the days with 10 cm/day), before around 1986. In short, the decrease in the total snowfall in the latter half period there seems to be reflected by the weakening of persistency of heavy snowfall episodes.

As shown by Akiyama (1981a and b) in detail, there are several different synoptic situations in the winter monsoon situation for bringing heavy snowfall there (the “mountain snow type” and the “plateau snow type”). The present study illustrates that many of the heavy rainfall days before 1986 corresponded to the “plateau snow type”. It is interesting that the area of synoptic-scale cold vortex at 500 hPa level, which brought such persistent heavy snowfall episodes, tended to extend gradually also westward in the former period. Decrease in such event seems to result in the persistency of these snowfall episodes in the former period.