

## Recent Increase of Extreming Snowfall events in Kanto and its Relation to the Shift of Large-scale Atmospheric Circulations.

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The Kanto region does not snow much throughout the winter, and the measures against snow are weak compared with the Hokuriku region, which is a heavy snowfall region, compared to the Sea of Japan side. Therefore, once snowfall occurs, it has a great impact on lifelines. As an example, in February 2014, 72 people were injured when a train that stopped braking due to heavy snow collided with a preceding train stopped at a station.

Such snow and ice accidents may occur in the future, and it is necessary to predict future snowfall in the Kanto region. Some studies have used numerical models to predict future snowfall. In order to predict the future, it is good to look at a virtual world such as a numerical model, but first it is necessary to know what is happening up to the present and how it has changed between the past and recent years.

Therefore, the purpose of this study is to statistically compare the environmental fields of January and February in the Kanto region, which has a great social impact due to snowfall and snowfall, and to examine how environmental fields have changed in the past and in recent years.

First, in order to confirm whether there is a difference in the total amount of snowfall between the past and recent years, we looked at the changes in the total amount of snowfall in the Kanto region during the 58 years from 1961 to 2018 in January and February of each year.

Then, once every few years, there was a year that greatly exceeded the normal value. However, let before 1988 is first half and after 1989 is second half, there was no significant difference in the annual average snowfall in the past and recent years, not in the first half or the second half of the period. Well, the regime shift occurred at the border of 1988/89, and the climate changed greatly. Therefore, when the years were sorted in descending order of total snowfall, the years after the regime shift that occurred in the latter half of the 1980s were particularly high (Fig. 1).

Therefore, the factors in which the years after 1989 stand out are considered by comparing the difference of the average of each meteorological field on a snowy day by using the composite map analysis. In order to extract snowfall cases due to the South Coast Cyclones, the definition of the snowfall day was defined as the day on which more than 1 cm of snowfall was observed at 5 out of 8 locations in the Meteorological Office of the prefectural capital and Tateno (Ibaraki Prefecture). In addition, in order to consider the factors that have more snowfall years in recent years, we selected the extracted cases as “extreme cases” when the total of 8 points was 100 cm or more, and “normal cases” except the extreme cases. We investigated from two cases, the increase / decrease in the number of extreme cases and the increase / decrease in the amount of snow (precipitation) per case in both extreme and ordinary cases.

The total number of extracted cases was 40 in the last 30 years, and in recent 28 years was 30, totaling 70 cases, and the total number of cases was reduced from 40 to 30. However, Fig. 1 shows that the total amount of snowfall in January and February of each year is higher in recent years, and the number of extreme cases has increased in the past 5 cases, 9 cases in recent years.

Then, to consider why the number of extreme cases increased to confirm the change of the storm track, it became stronger from the South Sea to the East Sea of Japan. At the same location, the north-south temperature gradient of sea surface temperature also increased.

Next, the amount of snowfall (precipitation) in each of the extreme and ordinary cases was examined, there was a significant increase in precipitation in both cases.

Based on the fact that the storm track has been strengthening in recent years, we are considering the factors, in the past and in recent years fields, focusing on the entire Northern Hemisphere and the Arctic region, the snowy years and the number of extreme cases have increased in recent years. This analysis will be announced on the day.

Keywords: South Coast Cyclones, storm tracks, Regime shift

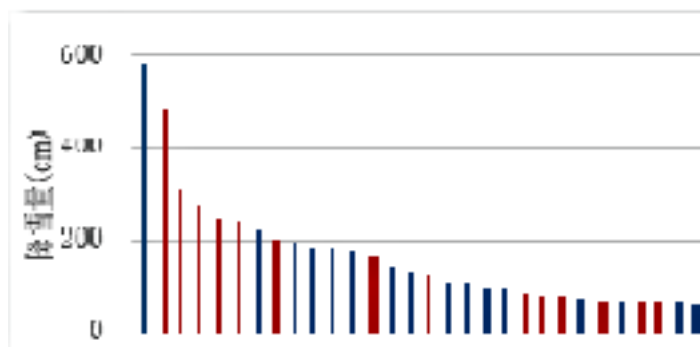


図1 1961~2018年の58年間の各年1,2月総降雪量[cm]を多い順に上位30年並べた。赤は1989年以降、青は1988年以前を表す