

Observational study on characteristics of ground snow crystals in the metropolitan areas in Japan

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In the metropolitan areas including Tokyo in Japan, snowfalls are sometimes brought by winter extratropical cyclones called “the South-Coast Cyclones (SCCs)”. In order to predict heavy snowfall events caused by SCCs, it is desired that cloud and precipitation processes and characteristics of snow are understood through observational studies. In this study, to reveal the characteristics of ground snow crystals in the metropolitan areas, we investigated types of ground snow crystals and associated environmental conditions of cloud properties and thermodynamic fields.

Ground snow crystal data obtained by smart phones in Tsukuba city from November 2016 to March 2019 were used in this study. Snow crystals in 9 cases of snowfall associated with SCCs were classified into 9 types every hour. As a result, snow crystals of column, dendrite, crossed plate, bullet, and needle were observed in 4 cases (Cyclone A), although most snow crystals were dendrite and rimed crystal in 5 cases (Cyclone B). From the analysis of the weather charts, all cyclones in Cyclone A were extratropical cyclones with synoptic-scale fronts, and in Cyclone B almost all cyclones were without a front. As a result of investigating the cloud properties and environmental fields for each cyclone using satellite data and the JMA local analysis data, the cloud top temperature of Cyclone A was lower than -30°C , but that of Cyclone B was about -17°C . The Cyclone A had a stronger advection of warm and moist air than Cyclone B. It is indicated that these differences in clouds and atmospheric environmental conditions for each cyclone caused the difference in the type of ground snow crystals.

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