

Factor that results in a decrease in snow surface albedo that promotes snow melting in the Kamikochi, Taisyoike

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Introduction

The biggest factor in melting snow is solar radiation. The decline in snow surface albedo has an important role in understanding the snow cover melting process, as it determines the amount of solar radiation absorbed on the snow surface. Albedo on the snow surface is known to be particularly heavily dependent on the size (snow particle size) of the snow particles and the dirt (snow covered impurities) on the snow surface. (Warren and Wiscombe 1980) Black carbon, mineral dust and organic carbon are cited as accumulated snow impurities, but the effect of lowering albedo differs greatly depending on the characteristics of the impurities observed. Although it has already been reported that the main melting heat in the snowfall of Taisho Pond research site in the highlands is an increase in the shortwave radiation balance due to the decrease in Albedo (West Village and other 2018), the factors causing the decrease in Albedo are still unknown. Therefore, the research site of Taishoike in the upper highlands conducted a survey on the double snowfall periods of 2017-2018 and 2018-19 to evaluate the characteristics of the snowfall impurity and the effect of the snowfall impurity on the snow surface albedo, and further evaluate the effect of the snowfall particle size on the snow surface albedo.

Method

During the double snow accumulation period of 2017-2018 and 2018-19, snow accumulation samples were collected and snow accumulation cross section observation (layer structure, density, moisture content, snow quality, particle size) was performed in the vicinity of Taishoike in the upper highlands. The samples were taken back to the clean room, measured electrical conductivity and pH, and analyzed the principal ion concentration using ion chromatography. The concentration of snow-covered impurities (weight concentration) was determined by the strong heat loss test method using a quartz fiber filter, and the analysis was carried out with reference to electron microphotographs. ImageJ, an image analysis software, was used as the particle size of the snow.

Result & Discussion

The snow covered impurities found in the Taisho Pond in the Kamiyo highlands were mainly organic matter, plant pollen. As for inorganic matter, yellow sand was found in the incubation period, but soil dust was found in the snow melting season. It has already been reported that organic carbon does not contribute to the reduction of Albedo on the snow surface. According to the results of intensive observation conducted in February 2019, the relationship between inorganic snow impurities and albedo was suggested during the incubation period, but in the overall snow-covered season, the concentration of

snow impurities showed a tendency to rise, but since it flowed out in the latter half of the snow melting season, there was no apparent relationship with albedo. Therefore, it is thought that the snowflake impurity contributes little to the lowering of the snow surface albedo. On the other hand, looking at the relationship between the particle size of the snow and the snow surface albedo, the decision coefficient is high, and it is thought that it is mainly the particle size of the snow surface albedo that affects the snow surface albedo. Further, since the snow accumulation impurity does not contribute to the albedo, it has been found that the cause of the lowering of the albedo accelerating the snow melting is an increase in the snow accumulation particle size caused by the temperature rise.

Keywords: snow surface albedo, snow covered impurities, snow grain size

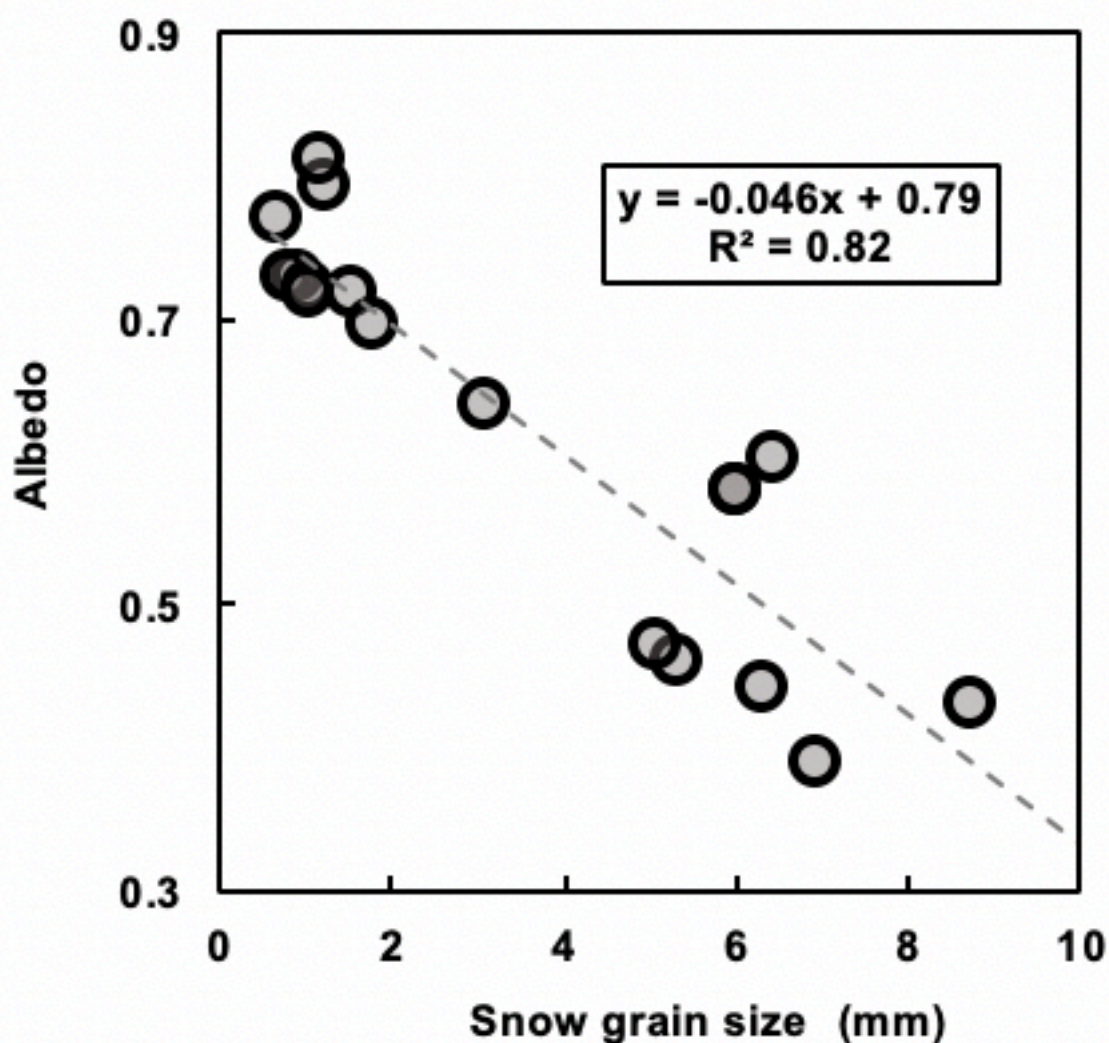


Fig. Snow surface albedo & Snow grain size