

B10-P08

TEMPORAL CHANGE IN CHLOROPHYLL-A CONCENTRATION ON A SNOWPACK IN QAANAAQ ICE CAP IN NORTHWEST, GREENLAND

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Snow algae are photosynthetic microbes growing on snow and ice and are commonly found on glaciers and snowfields in many parts of the world. Bloom of snow algae can change color of snow to red or green, and reduce its albedo, then accelerate melting of snow. Therefore, it is important to determine factors of their growth in order to project melting of snowpack. However, it is still not known what the most major factor for the growth is. In this study, we aim to determine the factors of initiation and growth of snow algae on snowpack based on field study on Qaanaaq ice cap in the northwest Greenland. The field study was carried out from June to August of 2014. We measured physical and chemical properties of surface snow and collected the snow samples at two locations (Site-A 550m, Site-B 950m a.s.l) on the glacier every week. In a laboratory, we analyzed chlorophyll-a concentration (*Chl-a*) using a fluorescence meter in snow samples to observe temporal change of algal growth on the snow surfaces. These data were compared with other physical properties of snow surface and meteorological conditions in order to determine the factors driving the snow algal growth.

Red snow visibly appeared on the snow surface on July 20 and August 3 at Sites-A and B, respectively. *Chl-a* concentration on the snow surface started to increase when the red appeared, and then reached 70 and 20 [$\mu\text{g m}^{-2}$] in early August at Sites-A and B, respectively. Daily mean temperature exceeded 0 °C on June 24 at Site-A and on June 25 at Site-B, which were 27 and 40 days prior to the appearance of red snow, respectively. The positive degree day and total snow melt before the appearance of red snow were 170 °C day and 121 cm at Site-A, 105 °C day and 106 cm at Site-B. There was no other significant change of physical or chemical conditions on the snow surface including solar radiation, snow density, water content, EC, and pH when the red snow appeared. These results suggest that initiation of snow algae does not require a certain physical or chemical conditions of snow surface, but may require a certain period of surface melting (approximately 27 – 40 days or 105 to 121 °C day).