Geographical variations in pigment compositions of snow algae in Japan

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Snow algae are photosynthetic microbes inhabiting melting snow surface in alpine and polar regions. Their blooms cause visible red or green coloured snow due to various pigments in their cells. Such coloured snow commonly appeared on snow fields in Japanese mountain regions in early summer. However, geographical differences in algal species or pigment compositions are little known. In this study, we aim to describe snow algal community and their pigment compositions in geographically different areas and to understand the relationship among algal pigments, cell morphology and species of colored snow in Japanese mountain regions.

Coloured snow samples were collected in three mountain regions in Japan, including Mt. Ibuki in Shiga prefecture, Mt. Gassan in Yamagata prefecture, and Mt. Tateyama in Toyama prefecture during the melting season (April to July) of 2015. We microscopically observed cell morphology, and analyzed absorption spectra and chromatograms of pigments extracted from the collected samples.

The absorption spectra of extracts from the collected snow samples showed various absorption peaks corresponding to chlorophyll *a*, astaxanthin, and other pigments. The spectra varied among the samples and study areas and can be classified into 5 types (Types A-E). The pigment compositions of each absorption type analyzed by chromatograms showed no significant difference. However the relative abundance of each pigment differed among the spectrum types. Microscopy revealed that the samples contained various morphologies of algal cells and that the relative abundance of the algal cell types differed among the spectral types. The results suggest that the geographical variations in pigment compositions are probably due to different community structure of snow algae among the study areas. The snow algae in each area appeared to be localized species and not to disperse over the snow fields in Japan.