

Characteristics and formation process of cryoconite granules on Urumqi No.1 Glacier in Tianshan Mountains, western China.

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On surface of glaciers, there are various impurities such as mineral particles and organic matters. These particles often form granular complexes, called cryoconite granules. The granules are small and spherical-shape algal mats formed by filamentous cyanobacteria on glaciers. The granules enlarge as cyanobacteria grow and trap mineral and organic particles on their surface. On Asian glaciers, a large amount of cryoconite granules covers the glacial surface, significantly reduces the surface albedo, and accelerates melting of the glacier. Thus, it is important to understand their formation process not only for ecology of cyanobacteria on glacial surface, but also for their effect on glacial melting. In this paper, we described characteristics of cryoconite granules collected from Urumqi No.1 Glacier in Tianshan mountains, western China. Thin sections of the granules were made to observe inner structures of the granules. Formation processes of the granules are discussed based on the observed structure.

Cryoconite granules on the glacier were brown-colored and 1.11 mm in mean diameter. Microscopic observation revealed that the inner structure of the granules can be classified into four types: Type 1) the granules that have multi-layers inside, Type 2) the granules that have more than two smaller granules inside, Type 3) the granules without any layers, Type 4) the granules that have a large mineral particle at the center the granule. From the results of analyze cryoconite granules' shapes and cross section structures, the structures of cryoconite granules of Urumqi No.1 glacier are grouped into four types. Each type of granule is likely to be formed in different surface conditions on the glacier.