The spatial distribution of the cyanobacteria and the factor on Urumqi Glacier No.1 in Tien Shan Mountains in China.

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Cyanobacteria are photosynthetic microbes living on glaciers worldwide. A phylogenic study revealed that the glacial cyanobacteria have 20 major phylotypes and their community structure geographically vary among glaciers. Each phylotype should have suitable growth conditions on glaciers and dispersal limitation. However, such information is little known. Cyanobacteria on glaciers often form cryoconite granules, which are microbe-mineral aggregates. The cryoconite granule can reduce surface albedo of glaciers and accelerate the melting rate of the ice. Therefore, it is important to know the factors to determine the community structure of cyanobacteria on the glaciers. In this study, we investigated the spatial distribution of biomass and species composition of three major taxa of cyanobacteria (Oscillatoriales A, B, C) on Urumqi Glacier No.1 in Tien Shan Mountains in China. The spatial distribution was compared with chemical and physical conditions on the glacier surface to find the environmental factors to control the growth for each cyanobacterial taxon. Microscopic analysis revealed that biomass and species composition of the three cyanobacterial taxa varied spatially on a glacier. The mean total biomass of the three taxa is significantly larger in the central part compared with those in the left or right side of the glacier. There is a significant positive correlation between the total biomass and mineral abundance of the surface, suggesting that mineral particle affect the growth of cyanobacteria regardless of the taxa. The spatial distribution of the three taxa showed different patterns on the glacier. Oscillatoriales A was the smallest percentage at the all of the site. Oscillatoriales B was dominated at the lower west side on the glacier. Oscillatoriales C was dominated at the upper east side of the glacier. According to the remote sensing study, winter snow cover over the Urumqi Glacier No.1 melted from the lower west side and extended to the upper part. This suggests that Oscillatoriales B dominates where the bare ice surface exposed earlier while Oscillatoriales C dominates where winter snow remains later. Duration of exposure to sunlight may be a factor to determine the dominance of Oscillatoriales B or C.

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