Distinctive nitrogen cycles between Asian and polar glaciers

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In spite of low temperature and nutirient-poor envirionment, there are diverse microbes living on polar and alpine glaciers. Since nitrogen is one of the limited but important nutrients on glaciers, studies on sources and biogeochemical cycles of nitrogen on glaciers are important to understand abundance and community structure of the microbes. Oxygen and nitrogen stable isotopes of nitrate provide a means to determine the source and microbial processes in the ecosystems. In this study, we describe the nitrate stable isotopes in snow, ice, and meltwater on two microbially distinctive glaciers, which are a glacier in Tienshan Mountains, China, and a glacier in northwest Greenland, and discuss the difference of nitrogen cycles between the Asian and polar glaciers

Microbial communities of both the Tienshan and Greenland glaciers consisted mainly of cyanobacteria and heterotrophic bacteria. Nitrate and annmonium concentrations in meltwater was generally higher on the Tienshan Glacier than on the Greenland glacier. The oxygen isotopes of nitrate in meltwater showed distinctive values between the two glaciers. The isotope ratios were higher than 50‰ on the Greenland glacier while were lower on the Tienshan glacier. This indicates that the nitrate is mostly atmospheric origin on the Greenland glacier, but is microbial origin, i.e. derived from nitrification, on the Tienshan glacier. The nitrogen isotopes of nitrate varied within each glacier. The variation is likely due to denitrification on the Tienshan glacier, but to mixing of the sources of present atmospheric deposition and past deposition in old glacial ice. Results suggest the contrast of nigrogen cycle between the Asian and polar glaciers. The nitrogen cycles were characterized by active microbial recycling on the Tienshan glacier, while by simple microbial use and supplies from atomosphere and old ice on the Greenland glacier.