B04-O07

THERMAL AND HYDROLOGICAL CONTROLS OVER ORGANIC MATTER REDISTRIBUTION IN GLACIAL SNOW COVER

Krystyna Koziol *(Department of Geography, University of Sheffield & Arctic Geophysics Department, University Centre in Svalbard (UNIS), United Kingdom)*
Emma Brown *(Department of Geography, University of Sheffield & CEH Bangor, United Kingdom)*
Nick Rutter *(Northumbria University, United Kingdom)*
Helen Moggridge *(Department of Geography, University of Sheffield, United Kingdom)*
Andrew Hodson *(Department of Geography, University of Sheffield, United Kingdom)*

k.a.koziol@gmail.com

Cells and organic carbon (OC) are vital components of the supraglacial ecosystem and their distribution in snowpack changes rapidly during melt. A small-scale experiment was conducted to elaborate their fate during melting and refreezing in snow on Foxfonna glacier, Svalbard. This led to a conceptual understanding of the co-evolution of the thermal, hydrological and biochemical state of the snowpack and surface ice, which was found to develop in three stages:
(1) Melting front penetration into the cold snowpack, leading to intensive OC removal from snow and its capture as a superimposed ice layer on the glacier surface (early stage); later on, following melt water inundation of the snowpack, the majority of cells were also eluted from any remaining snow and captured in the refrozen layer
(2) An isothermal snow and superimposed ice profile development, during which time the OC and cell removal in streams was marked
(3) Superimposed ice ablation, which was followed by an intensive release of cells and OC into runoff after this refrozen layer decayed.

The effect of rapid warming on OC transfer to supraglacial and downstream ecosystems was therefore found to be buffered by superimposed ice zone development, delaying the release of both nutrients and cells. In this study, the superimposed ice accumulated 0.096 ± 0.011 g m^{-2} TOC (total OC), 87% of which was DOC (dissolved OC), and 265 ± 27 × 10^7 cells m^{-2}. The cells were released rapidly after the superimposed ice was exposed and decayed, with a single meltwater pulse discharging fourteen times the cell concentration of that of the original snowpack. However, a simple OC budget showed net retention of 0.134 ± 0.033 g m^{-2} TOC and 0.040 ± 0.019 g m^{-2} DOC, whilst the cell concentrations showed a negative budget of -144 ± 55 × 10^7 cells m^{-2}, and therefore they were entirely released by the time the glacial ice became exposed.