

Light and life beneath sea ice in the Canadian Arctic

Neukermans Griet, Guislain Bécu, Eric Rehm and Marcel Babin

ULaval, Pavillon Alexandre-Vachon, 1045 Avenue de la Médecine, Université Laval, Québec (Québec)
G1V 0A6, Canada

E-mail: griet.neukermans@takuvik.ulaval.ca

In the last three decades, unprecedented changes have been observed in the Arctic. The region is warming two to three times faster than the global average, resulting in a rapid decline of extent and thickness of sea ice. This strongly influences light penetration and phytoplankton growth in the Arctic Ocean.

In the frame of the GreenEdge project, we monitored the development of a spring bloom of microalgae (sea ice algae, as well as phytoplankton) from an ice camp in April-July 2015 in Baffin Bay, Canadian Arctic. We observed strong variations in space and time of the spectral light intensity in the ice-covered water column and of the microalgae concentration and composition beneath sea ice. Early in the season, spatiotemporal changes in snow depth appeared to be the major driver of changes in light and life beneath the ice cover. For example, the contrast in snow depth between two sites, spaced 40 meters apart, resulted in an order of magnitude difference in the amount of light transmitted to the ocean beneath. Strong spectral differences in transmission were also observed owing to light absorption by ice algae, which bloomed in the low snow site but were absent from the high snow site. Complex irradiance profiles with sub-surface maxima were found in the high snow site caused by spatial heterogeneity in the overlying snow cover. The high spatiotemporal variability of light and life beneath sea ice poses great challenges for monitoring algal blooms in the Arctic's ice-covered waters.

More information of the GreenEdge project: <http://www.greenedgeproject.info/>

Blog of monitoring campaign in 2015: <https://greenedgeproject.wordpress.com/>

GreenEdge project educational site: <http://www.aoa.education/>

GreenEdge project documentary teaser, Parafilms Production: <https://vimeo.com/141660727>

Keywords: Arctic Ocean; phytoplankton; light; sea ice algae