The Causes and Consequences of Increased Active Layer Depth in Arctic Tundra Ponds Over the Past 40 Years

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Active layer is used to describe the upper most layer of soil that thaws each summer in the Arctic. With a warming Arctic, permafrost is expected to thaw and active layer depth to increase, thus releasing organic material and nutrients into aquatic environments; however, there are few long-term datasets available to test these predictions. The ponds at the International Biological Program (IBP) site in Barrow, Alaska represent one of the only locations in the Arctic with long-term aquatic ecosystem data. The objective of this study was to determine whether the temperature of tundra ponds has increased over the past 40 years, and how this has impacted thaw depth. Water temperature at 6 ponds was recorded continuously using loggers. Thaw depth was measured on a monthly basis on transects across the deepest part of 3-5 ponds. Preliminary results indicate an average of 2°C warmer temperatures in the ponds in the 2000’s, compared to the 1970’s, as well as the increase in thaw-depth by 32cm at peak season. This increase in temperature and thaw depth was coincident with increased dissolved organic carbon (DOC). This study will add to our understanding of the impact of warmer temperatures on Arctic aquatic biogeochemistry.