

Changing Arctic Snow and Ice: *In situ* Monitoring using Digital Imagery

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ABSTRACT

In the Arctic region, a rapid loss of snow and ice cover has been observed in recent years. The effects of this loss have significant impacts on global climate, hydrological events, biological processes, and human populations. Previous studies have measured changes in snow and ice cover using satellite imagery and model-based approaches. Novel research is beginning to utilize ground-based automated camera systems for *in situ* monitoring of lake and river ice. The overall aim of this study is to maximize the usage of field imagery for snow and ice studies within the context of the changing Arctic climate. This study is focused on monitoring lake ice and snow at five study lakes (Resolute Lake, Small Lake, Plateau Lake, North Lake, and Hunting Camp Lake) near Resolute and Nanuit Itillinga, Nunavut in the central Canadian High Arctic with data available from 2016-2021. The objective of the research is to develop a feasible method for snow and lake ice data quantification from *in situ* digital imagery and examine the recent variability in snow and ice phenology using the method developed. Preliminary results using image segmentation techniques show promising results for tracking the progression of ice formation and snow redistribution across the lakes. Ongoing work is focused on assessing the most viable method for automation. The significance of this research will work to develop a practical and accessible *in situ* methodology using automated cameras to assess Arctic climate change through observational science. Ultimately, the results from this study will provide critical insight into the spatial conditions of lake ice and snow in the study region under the current climate regime, which will support better projections under warming climate conditions in the Arctic.

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