Variability in Thermokarst Lake Size, Elevation, and Connectivity in the Western Canadian Arctic

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ABSTRACT

Large parts of the Arctic are densely covered by vast numbers of thermokarst lakes, ranging in size and stream network connectivity. Such stream-lake networks are poorly studied in the Canadian Arctic. However, a warming climate coupled with permafrost thaw and precipitation change will significantly influence the hydrology of these lakes, including changes in water surface elevation (WSE) and area. Understanding the impact of controls such as climate, snow-cover, vegetation, permafrost thaw, beavers, and hydrological connectivity on WSE requires a combination of field and remote sensing observation and integrated snow, permafrost, runoff, and lake hydrologic models. This paper will present the first step in putting such an observing system in place. We will report on observations of lake WSE across 50 lakes north of Inuvik, NWT. These lakes are located in two contrasting watersheds - Trail Valley Creek (TVC) and Hans Creek (HC). TVC is lake poor while HC is lake rich with a dense network of connected streams and lakes. In addition, HC is dominated by large networks of ice-rich polygonal terrain that is prone to thawing with dramatic impacts on these lakes. These thermokarst lakes are important habitats for migratory birds, fish, and mammals and vital to sustaining hunting, fishing, trapping, transportation, freshwater resources, and recreation of those that live in the north. This project will contribute to a Canadian Space Agency project aimed at validation of WSE estimates from the Surface Water and Ocean Topography (SWOT) mission to be launched later in 2022 and development of integrated lake-stream network models.

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