

Project acronym: PCEOM

Project title: Permafrost Coastal Erosion: Observation and Modelling

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Discipline: Earth Sciences & Environment

Station(s): Western Arctic Research Centre (Canada)

In the western Canadian Arctic, erosion rates along unlithified permafrost coasts have increased by between 20 and 200% over the last 2 decades, with some regions now experiencing retreat rates of dozens of meters per year. However, regional variability is still high, and the processes governing the different types of erosion and failure mechanisms are not well understood - making it difficult to project erosion rates or the influence of climate change. This project aims to improve our understanding of these erosional processes through a combination of new and common observational techniques, in conjunction with numerical modelling. During this field project we visited numerous sites in an around the Tukoyoyaktuk (Tuk) region, from Toker Point to the north east to the massive block failure coasts of Pelly Island to the west.

At these locations, drone based photogrammetric surveys were complemented with data captured from helicopter, boat and on ground, a range of in situ instruments (thermistors strings, time-lapse cameras, accelerometers, etc) and geotechnical and geochemical sampling. Two sites were given particular focus, Tuk Island and Peninsula Point. Tuk Island, with its position at the mouth of Tuk harbour, is important for the maintenance of waterways and in protecting Tuk and its infrastructure from erosion. However, the island is eroding at such a rate that the ocean may cut through it in just a few decades, thus increasing erosion rates on the northeast side of Tuk. It is therefore important to collect the data necessary to better understand the erosional processes on Tuk Island. Peninsula Point is a dynamic site with several retrogressive thaw slumps, at different phases of activity and some rapid headwall retreat rates. It has a widespread ice layer and frequent ice wedges. It is a well-studied location with reasonably easy access from Tuk (15 minute boat journey). As the processes governing thaw slumps are poorly understood, this was chosen as a key study site for gathering data on thaw slumps with the hope of being able to represent the processes within a numerical modelling package.

Overall, it is hoped that the data collected, instruments put in place and samples taken to contribute to an improved understanding of permafrost coastal erosion.