

# Nonlinear feedbacks in glacier response to climate change

## Bio:

Shawn Marshall is a research scientist with Environment and Climate Change Canada (ECCC), where he studies glacier-climate processes and the representation of glaciers in hydrological and climate models. Dr. Marshall joined ECCC in 2019, following a research career as a glaciologist and Canada Research Chair in Climate Change at the University of Calgary. He combines modelling and field studies at research sites in the Rockies, Arctic Canada, and Greenland to advance understanding of glacier response to climate change. Dr. Marshall is an Adjunct Research Professor in the Department and is looking forward to collaborative opportunities studying Arctic cryosphere and climate change.

## Abstract:

Glaciers worldwide are experiencing accelerated mass loss in recent decades, at rates that exceed what is expected from just the effects of climate warming. Changes have been dramatic in western Canada, where the rate of glacier thinning has doubled since 2020, relative to the prior decade (Menounos et al., 2025). The accelerated thinning is indicative of positive feedbacks to glacier retreat, nonlinear processes, or additional climate forcing beyond just the direct effects of warming. It is probably all of the above, but I will discuss different nonlinear and feedback processes that help to explain the glacier response in western Canada, including model experiments that help to isolate and identify what is driving recent observed changes. Much of the acceleration can be explained by albedo reductions, i.e., darkening of the glaciers, driven by both melt feedbacks and by the widespread deposition of impurities and organic carbon from wildfires.

## TOPOGRAPHIES

DGES Speaker Series

**Dr. Shawn Marshall**

Research Scientist and Chief Science Officer  
Environment and Climate Change Canada



Wednesday, October 1<sup>st</sup>

2:30-4:00 p.m.

In Person, Loeb A220

All are welcome



**Carleton**  
University

Department of  
Geography and  
Environmental Studies

The Geography and Environmental Studies Departmental Seminar Series is committed to accessibility for persons with disabilities. Please send requests for accommodation to [Nika.Linseman@Carleton.ca](mailto:Nika.Linseman@Carleton.ca)