

# PROGRESS REPORT on 2023 FIELD ACTIVITIES

## Glacier Mass Balance Studies in the Canadian High Arctic

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#### 1. INTRODUCTION

Knowledge of the mass balance of ice caps and glaciers in the Canadian high Arctic provide important information required understand patterns of climate change, and to validate current estimates of global sea-level contributions from this region. Through continuation of the long-term time series (~60 years) of glacier change for several monitored glaciers in the Canadian high Arctic, this project contributes towards the fulfillment of NRCan's mandate and LMS strategic outcomes through activities in the Geological Survey of Canada. Output from this project delivers towards Departmental SO #3 under the PA3.1.3 in order that *Science and knowledge are used to help Canada adapt to a changing climate* – in particular, *the impact of climate change on Canada's landmass is assessed, and strategies are developed to adapt to these changes*. In addition, aspects of community infrastructure and sustainable northern resource development including transportation and energy are supported by information on Cryosphere system change.

#### 2. RESULTS

##### **Glacier Mass Balance Measurements – Spring, 2023**

Measurements of glacier mass balance were collected from the GSC glacier monitoring sites in Nunavut, i.e. Meighen, Agassiz, and Devon ice caps, and the Grise Fiord Glacier between April 4 and May 21, 2023. The measurements collected in 2023, combined with those from 2022 provide the information necessary to calculate average net mass balance for the 2021-2022 mass balance year.

Results from the 2023 field campaign indicate that the mass balance for the 2021-2022 mass balance year indicate variability for all three sites relative to the long-term averages (see Table 1). While the 2021-2022 mass balance for Meighen and Devon Ice Caps were almost 2 times more negative than the long-term average, results from the Grise Fiord Glacier indicate a less negative balance than the long-term 'normal'. Results from this work contribute observational evidence towards documenting climate change across the

Canadian Arctic, and for quantifying estimates of sea-level rise from northern hemispheric ice caps.

**Table 1.** Long- and short-term measures of thickness change across monitored glaciers in the Canadian high Arctic.

<i>Ice Cap/Glacier</i>	<i>Long-term Average* Thickness Change (cm w.e.)</i>	<i>Thickness Change 2021-2022 (cm w.e.)</i>
Devon (NW)	-20	-51
Meighen	-24	-45
Grise Fiord Glacier	-108	-83

\*Long-term averages are calculated over the period 1980-2010 for Devon and Meighen ice caps, and 2002 (start of record) -2021 for the Grise Fiord Glacier.

### **3. WORK PROPOSED FOR SPRING 2024**

We propose to continue the glacier mass balance measurements over the Devon, Agassiz, Meighen, and Melville ice caps, and the Grise Fiord Glacier. This work involves maintenance and data retrieval from the Automatic Weather Stations (AWS), and pole measurement and replacement (or extension) as required. There will be no changes to the proposed work completed in 2023.

### **4. LOGISTICS**

Transportation to field sites will be provided by the Polar Continental Shelf Program. All work on site will be performed out of a permanent hut that exist on the Melville ice cap, tents on the Agassiz and Devon ice caps, and Meighen Ice Cap, and the Co-op Hotel while in Grise Fiord. Transportation at each site will be by snowmobile.