

PROGRESS REPORT on 2017 FIELD ACTIVITIES Glacier Mass Balance Studies in the Canadian High Arctic NRI Licence# 02 003 17R-M

David Burgess, Natural Resources Canada (Ottawa)
Brad Danielson, Fiera Biological Consulting (Edmonton)

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 (~50 years) of annual surface mass balance measurements for the Northwest Devon ice cap, Meighen ice cap, Melville ice cap, and Agassiz ice fields, 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, 2017

All mass balance measurements from the South Melville, Meighen, Agassiz (Drambuie), and Devon (NW) ice caps, and the Grise Fiord glacier were successfully acquired in 2017. These measurements, combined with measurements from the previous year (ie. 2016) provide the information necessary to calculate net mass balance for the 2015-2016 mass balance year. Winter snowfall and variability across this region is generally quite low, so the mass balance of glaciers across this region are mainly dependent on the intensity and duration of melt that occurs during the summer months. Due to another relatively warm summer in 2016, the ice caps thinned 3-5 times faster in the 2015-2016 balance year than the long-term average (see table 1 below) which is consistent with the trend since the mid 2000's. Results from this work are essential for quantifying estimates of sea-level rise and documenting climate change across this region.

Table 1.

<i>Ice Cap</i>	<i>Long Term (1960-2016) Net Mass Balance (cm w.e.)</i>	<i>Thickness Change 2015-2016 (cm w.e.)</i>	<i>Total Mass Loss 2015-2016 (Gt)</i>
Devon (NW)	-13	-48	-0.77
Meighen	-17	-73	-0.04
Melville	-30	-79	-0.04

3. WORK PROPOSED FOR SPRING 2018

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 are no significant changes to the work planned for 2018 relative to the activities performed in 2017.

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.