Non-Technical Project Proposal Description of "Glacier Mass Balance and Snow Pollution Studies in the Canadian high Arctic"

RESEARCHER'S NAME AND AFFILIATION: David Burgess, Canada Center for Remote Sensing, Natural Resources Canada

PROJECT LOCATION: Meighen, Melville, Agassiz, and Devon ice caps and the Grise Fiord Glacier

TIMEFRAME: April 16, 2009 – December 31, 2011

PROJECT DESCRIPTION:

PURPOSE: This is an ongoing study aimed at monitoring the mass balance and pollution levels of the Melville, Meighen, Agassiz, Devon ice caps, and the Grise Fiord Glacier (Figure 1). An additional component to this work will be to measure variations in flow rates of 3 glaciers on the Devon ice cap in order to understand how these glaciers will respond to future climate warming. Transportation at each site will be by snowmobile or helicopter where requested.

I. Glacier mass balance

Meteorological data will also be collected from the 11 automatic weather stations deployed as part of this network. Mass balance measurements provide an indication as to whether the ice caps under investigation are shrinking or growing in any particular year. This work will be performed out of permanent huts that exist on the Meighen and Melville ice caps, and tents on the Agassiz and Devon ice caps.

II. Snow sampling for monitoring pollution levels

Snow samples collected from each mass balance monitoring site will be returned to the GSC glaciology laboratory in Ottawa for analysis of the major pollutant ions (eg. Sulphates – acid snow) and pollen. Knowledge of the annual variability of pollen and pollutant concentrations at the monitoring locations improve provide important information towards quantifying current trends in levels of atmospheric pollution, understanding atmospheric circulation patterns, and interpreting long-term pollution trends from ice cores.

III. Variability in flow rates of major outlet glaciers on the Devon Ice cap

In-situ global positioning systems (GPS) will be deployed on 3 major outlet glaciers that drain the Devon ice cap. The in-situ GPS's will track the glacier's velocity on a daily basis over the course of a 2 year period of time. These data will **a)** provide ground validation to measurements of glacier velocity fields derived from satellite-based

methods and **b)** quantify seasonal variations in rates of glacier flow. These data are crucial to understanding the effects of climate warming on the dynamics and mass balance of high Arctic ice caps.

IV. Outreach programme

Outreach activities will be conducted in Grise Fiord where *on-ice* demonstration of the glacier monitoring techniques will be performed. Also, an in-class lecture about the glacier monitoring program across the Queen Elizabeth Islands will be presented to the junior and senior high school students.

V. Data and Reporting

The data collected from the mass balance surveys will be submitted to the World Glacier Monitoring Service in Switzerland. The GPS data from Devon ice cap will be used to produce a publication on the seasonal variability of glacier across this ice cap. The information gained from these studies will be also submitted to the communities of Grise Fiord and Resolute Bay as part of our annual progress reporting to NRI.

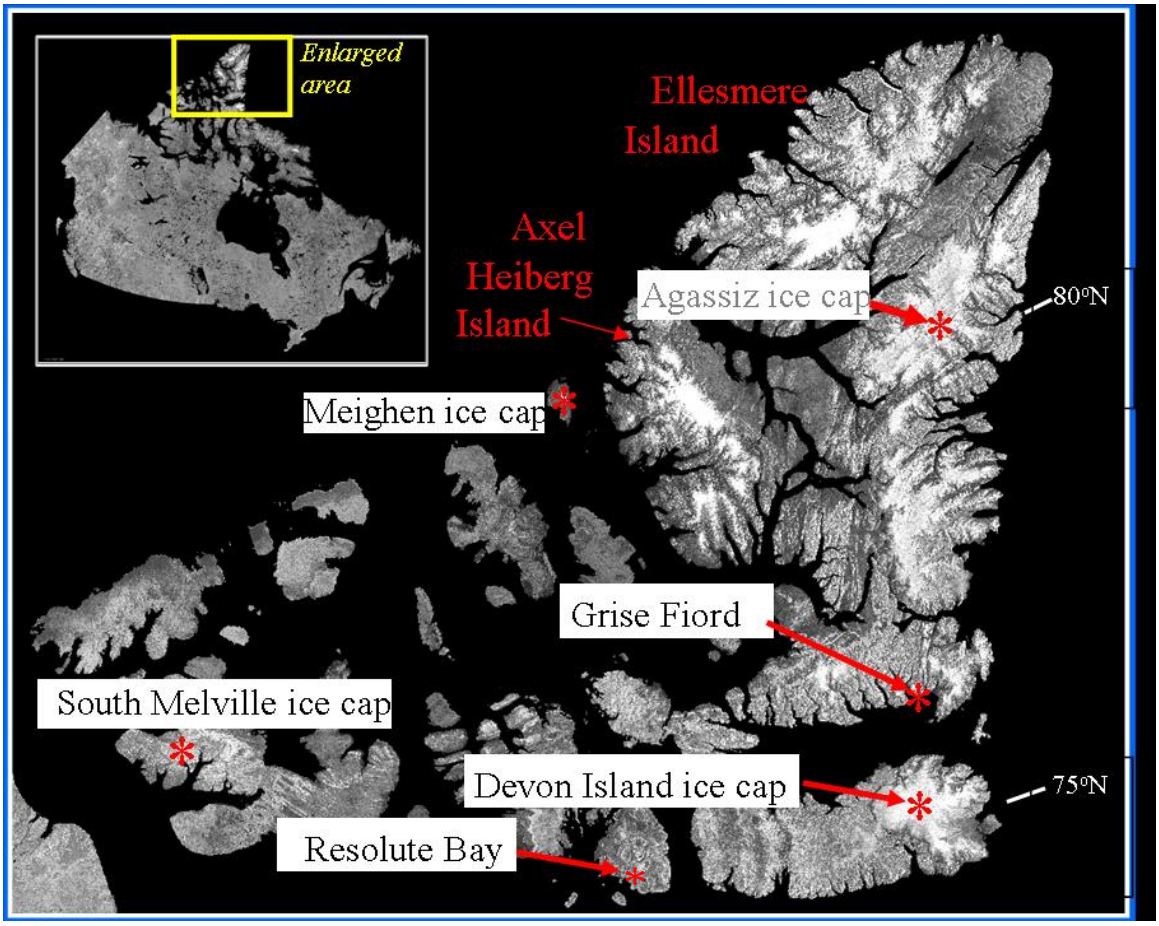

Figure 1. Location of mass balance and pollution monitoring sites across the Queen Elizabeth Islands

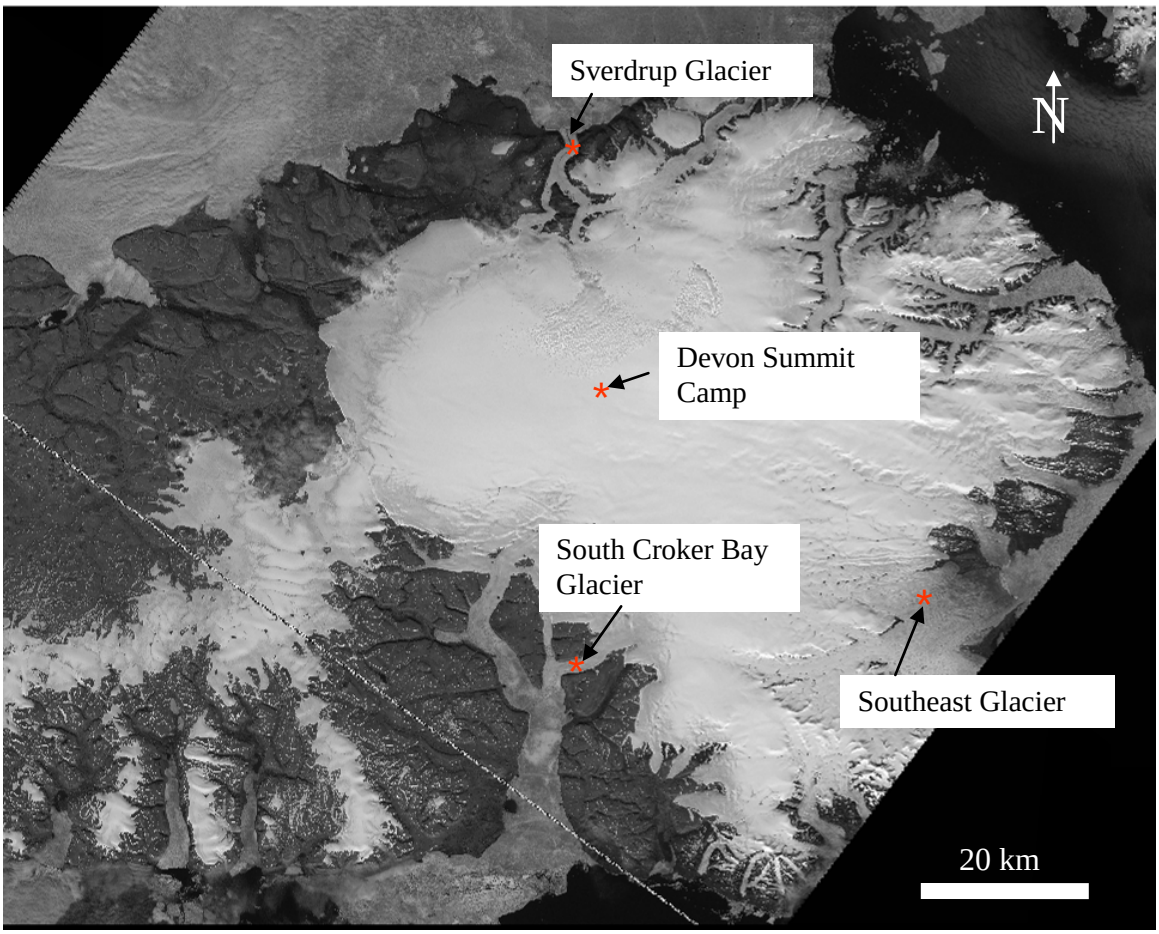

Figure 2. Location of outlet glacier sites on the Devon ice cap where GPS instruments are to be deployed via helicopter (May 11-13).