CHARACTERISING PERCOLATION AND WET-SNOW FACIES VARIABILITY ON DEVON ISLAND ICE CAP, NUNAVUT, CANADA

Michael N. Demuth [1,*]
Elizabeth M. Morris [2]
Hans-Peter Marshall [3, 4]
David A. Fisher [1]
John Sekerka [1]
Roy M. Koerner [1]
A. Laurence Gray [5]

[1]Geological Survey of Canada, Glaciology Section
[2]Scott Polar Research Institute, Cambridge UK
[3]Cold Regions Research and Engineering Laboratory
[4]University of Colorado, Institute for Arctic and Alpine Research
[5]Canada Centre for Remote Sensing, Applications Division

ABSTRACT: As the Earth's coldest regions undergo marked changes due to atmospheric warming, so will the surface facies configurations of its glaciers and ice sheets. Their percolation and wet snow zones will expand upwards and occupy more area. The inherent stratigraphic complexity of these zones will then impart greater uncertainty in glacier and ice sheet mass balance estimates derived from traditional stake and pit methods. Using impulse and FM-CW Gound Penetrating Radars, borehole neutron scattering and manual snow stratigraphy measurements, our goal is to better describe the spatial and temporal variability of the percolation and wet-snow facies. Our measurements consider sub-meter to kilometre to inter-facies scale variability.

Improved knowledge of such variability has practical significance. First, uncertainties in glacier and ice sheet mass balances remain largely unquantified – unsatisfactory as it concerns documenting relatively small changes over large areas. Second, the retrieval of wide-area mass balance change using elevation changes from repeat airborne and orbital altimetry (e.g., ALTM, ICESat, CryoSat) will require information on snow density, densification and the spatial scale of variability over the altimeter footprint. We suggest that there is a need for continual *in situ* validation studies over the lifetime of altimeter-based glacier and ice sheet change detection campaigns.

* *Corresponding author address:* Michael N. Demuth, 601 Booth Street, Geological Survey of Canada, Glaciology Section, Ottawa, ON, Canada, K1A 0E8; tel: 613-996-0235; fax: 613-996-5448; email: mike.demuth@nrcan.gc.ca