Geophysical Research Abstracts, Vol. 7, 05256, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05256

Ground based radar backscatter measurements in the percolation zone of the Greenland ice sheet

J.B.T. Scott (1), **D.W.F. Mair** (1), P.W. Nienow (2) and V.L. Parry (2)

(1) Department of Geography and Environment, School of Geosciences, Elphinstone Road, University of Aberdeen, Aberdeen, AB24 3UF, UK, (2) Institute of Geography, School of Geosciences, Drummond Street, University of Edinburgh, Edinburgh, EH8 9XP, UK

Satellite radar altimeters experience volume backscatter from within the snowpack as well as surface backscatter but are not able to differentiate completely between them. It is known that the radar backscatter from the percolation zones of ice caps is strong due to ice pipes and lenses that form due to surface melting, percolation and refreezing during summer melt events. This causes a temporal change in the backscatter that is not due to elevation change but rather a change in the volume scattering properties of the snowpack. Although some ground based measurements have been made in the percolation zone of the Greenland ice sheet the temporal backscatter variation from spring to autumn has not been fully investigated. As part of the calibration and validation of the European Space Agency's CryoSat, in situ field measurements were carried out during spring and autumn 2004 in the percolation zone of the Greenland ice cap at TO5 on the EGIG line at c. 2000 m elevation to determine the spatial and temporal variability in surface and near surface stratigraphy. In September 2004 *surface* based radar measurements were conducted over a range of very high frequencies (2 - 18 GHz) including those used by the satellite in order to understand better the interaction of the satellite radar with the percolation zones of ice masses. Radar experiments were carried out in conjunction with density profiling from shallow cores, snow pits and neutron probe as well as measurements of surface roughness, grain size and temperature. Field sites were also over flown by airborne radar and laser altimetry. To date the radar measurements are significantly different in character to those made in the percolation zone during June and July in the early 1990s by other teams. The strongest backscatter originates at the surface where there is a hard crust left at the end of the summer melt events, although there is still significant volume backscatter

from ice pipes and lenses. The radar backscatter varies significantly over even a small spatial scale of $\sim$ 2 m and it is not possible to trace reflecting horizons by profiling. Further fieldwork is planned during the spring and autumn of 2006 to coincide with the calibration orbit of CryoSat. Further numerical work on the data and improved measurements in 2006 should provide essential information for the accurate determination of elevation changes by satellite radar.