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Boundary layer and near surface turbulence characterization at GEOSummit Station, Greenland using a sodar and micrometeorological data during June-July 2010

Brie Van Dam (1), Detlev Helmig (1), and William Neff (2)

(1) Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO , (2) NOAA Earth System Research Laboratory, Physical Sciences Division, Boulder, CO

Boundary layer conditions in polar regions have been shown to have a significant impact on chemical exchanges between the snow/ice surface and the atmosphere. To further understand the processes controlling these exchanges, it is important to properly define boundary layer characteristics (e.g. stability, depth and variations on a diurnal and seasonal scale). Boundary layer depths at Summit, Greenland have been described for a previous spring and summer season using near surface turbulence data (Cohen et al, 2007), but direct measurements of the boundary layer for comparison were lacking.

In this study, boundary layer depths for stable to weakly stable conditions are estimated using surface turbulence quantities derived from three 3-D sonic anemometers as well as gradient measurements of wind speed and temperature, all located on a 10 m flux tower at Summit, Greenland. These estimates are compared with direct boundary layer depth measurements from a sodar that was located approximately 15 meters from the flux tower between June-July 2010. Details on the sodar operation are given in the presentation by Neff, et al in this session. In addition to testing the diagnostic equations used for boundary layer depth estimation, this comparison of near-surface turbulence data and sodar observations assists in the understanding of how surface processes influence the boundary layer development and surface layer gas exchanges at this site.