Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09901, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09901
EGU General Assembly 2008


# Subsurface heat flux in the snow pack with hybrid sensor systems

H. Huwald (1), C. Higgins (1), M. Lehning (2), J. S. Selker (3) and M. B. Parlange (1)

(1) School of Architecture, Civil and Environmental Engineering, EPFL, Lausanne, Switzerland (hendrik.huwald@epfl.ch), (2) Swiss Federal Institute for Snow and Avalanche Research, SLF, Davos, Switzerland, (3) Department of Biological and Ecological Engineering, Oregon State University, Corvallis, OR, USA

Recent studies suggest that on short time scales subsurface heat flux in the snow pack near the surface can be a significant component in the surface energy balance. To calculate the subsurface heat flux and to investigate its temporal evolution, high resolution snow temperature profiles together with snow density data are required. Such profiles were measured over a snow-covered glacier in the Swiss Alps during the winters of 2006-2008 using traditional thermocouple and novel fiber optic distributed temperature instrumentation. Comparison between redundant measurements reveals significant differences depending on whether a sensor is exposed to solar heating or not. Even shielded sensors overestimate snow temperature near the snow surface during the day when solar radiation is high and the wind speed is low. To identify potential contributions of lateral heat flux due to horizontal inhomogeneity in the snow pack, a series of temperature profiles was obtained along a 20m transect. Air exchange at the snow-atmosphere interface and associated air movement within the snow pack constitute non-conductive energy transfer processes and must be considered too. To better understand the rate of gas exchange with the atmosphere controlling latent heat transport in the snow associated to phase changes, air movement in the snow was investigated using a novel in-situ carbon monoxide trace gas measurement system providing high resolution observation of snow transport process without gas extraction. Gas diffusion was found to be dominant below 30cm depth, while lateral wind driven advection maintained in-snow air velocities of 10m/day.