Geophysical Research Abstracts
Vol. 14, EGU2012-14099, 2012
EGU General Assembly 2012

Small-scale variability of alpine snow packs from fiber-optic distributed temperature

H. Huwald (1), S. Williams (1,2), C.W. Higgins (1,4), A.W. Nolin (3), S.A. Drake (5), J.S. Selker (4), and M.B. Parlange (1)

(1) School of Architecture, Civil and Environmental Engineering, École Polytechnique Fédérale de Lausanne – EPFL, Lausanne, (2) Physics Department, Imperial College London, (3) Department of Geosciences, Oregon State University, Corvallis, (4) Department of Biological and Ecological Engineering, Oregon State University, Corvallis, (5) College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, Corvallis

Variations in small-scale surface roughness, snow density and in the snowpack microstructure influence the surface and internal snow temperature, being key quantities for various heat flux components of the surface energy balance. Detailed knowledge on the spatial distribution and temporal evolution of snow temperature is crucial to quantify spatial variability in the subsurface and surface heat fluxes of the snow pack. We present measurements of small-scale temperature variations in alpine snow packs using fiber-optic distributed temperature sensing (DTS) together with traditional sensors at spatial resolutions much smaller than most common distributed snow cover models to shed light on subgrid-scale physics. Fiber-optic cables of several 100m were installed in a fence-like configuration in in the Swiss Alps to obtain 2D information on subgrid-scale snow variability. The setup allowed for computation of subsurface heat fluxes at 1m spatial resolution along the measurement transect based on the Fourier heat equation using snow temperature and snow depth data, and an effective thermal conductivity of the snow derived from density measurements.