



Contribution ID: 13

Type: **not specified**

Microstructural Modeling of Snow- and Firn Processes

Wednesday, 8 June 2011 09:15 (30 minutes)

The micro-structure of a sintered and porous material impacts its chemical and physical properties. In particular, sintering ice-crystals evolving from snow to firn alter the characteristics of the snowpack. We study the link between micro-structure and properties by numerical modeling based on experimental X-ray micro-tomography data or using discrete element model (DEM) snow as geometrical input. We use phase-field techniques to solve the two-phase (ice and air) heat and mass transfer problem in snow and to predict heat conductivity, evaporation-condensation, and sintering rates. We analyze mechanical behavior within the DEM framework, flow using Lattice-Boltzmann simulations, and study optical properties by Monte Carlo ray tracing techniques. The coupling with chemical models presents particular challenges.

Please list some keywords

snow micro-structure, modeling, X-ray micro-tomography, phase-field, discrete elements

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Session Classification: Modeling Workshop