Geophysical Research Abstracts,
Vol. 11, EGU2009-8973, 2009
EGU General Assembly 2009

Validation of a distributed physics-based model for permafrost simulations at Hoher Sonnblick, Austria, considering topographical diversity

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Model validation is an integral part of any computational simulation, including that of permafrost and related processes. One of the key factors in permafrost modeling is energy balance and heat transfer at the Earth's surface. In order to obtain valuable information on ground temperature, rigorous validation of the energy balance is necessary. We therefore discuss different validation methods for an energy balance model and give an overview of possible interpretations and of misinterpretations, which can arise from incomplete validation.

For the energy balance modeling we use GEOtop, a distributed physically-based model that solves coupled heat and water transfer budgets. In particular, we focus on the validation of GEOtop at the mountain Hoher Sonnblick in the Austrian Alps, since this location provides high quality meteorological data series and many other important measurements. We investigate spatial and temporal patterns of model errors using 1D-point simulations at several observation points by validating the model using diverse topographical settings. We can thereby more accurately characterize model behavior and confidence levels.