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# Calibration and Comparison of three SVAT (\textbf{S}urface-\textbf{V}egetation-\textbf{A}tmosphere \textbf{T}ransfer) models.

Paul Dobesberger (1), Antonia Zeidler (1), and Georg Wohlfahrt (2)

(1) Department of Natural Hazards and Alpine Timberline, Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW), Innsbruck, Austria (paul.dobesberger@uibk.ac.at), (2) Institute of Ecology, University of Innsbruck (UIBK), Innsbruck, Austria

This presentation is part of the research project RIMES (Climate Change and Natural Hazards **Ri**sk **M**anagement in **E**nergy **S**ystems) funded by the **A**ustrian **C**limate **R**esearch **P**rogram (ACRP). The project aims at the optimization of risk management procedures by addressing uncertainties of various domains (climate change, natural hazards, economical losses) and the standardization of a method to determine the vulnerability of an energy system. Climate change it is likely to affect the return period and magnitude of natural hazards, such as avalanches, debris flow or sediment transport. Important factors to be considered when researching those hazards are the alteration of soil and snowpack properties as well as the varying conditions for the vegetation.

Here we will use SVAT models for assessing climate change impacts on the soil, the snowpack and the growing conditions for the vegetation on a long term perspective. For this we will compare three SVAT models with different theoretical backgrounds and degrees of complexity. The first objective of the present study is a systematical and comprehensible calibration of the models with data from different Alpine stations in Tyrol/Austria. Therefore a Bayesian model calibration framework (DREAM – **D**iffe**r**ential **E**volution **A**daptive **M**etropolis) via Markov chain Monte Carlo method will be used. This algorithm runs multiple chains simultaneously for global exploration, and automatically tunes the scale and orientation of the proposal distribution in order to find the set of parameters which fits best to the target (e.g. soil water content). Hence the outcome of these simulations will be the range for each parameter of the model to fit the claimed target. Here the major interest will be in how well parameters of the three models differing in complexity are constrained by the same set of calibration data. The second objective of this study is the comparison of the measured and simulated water and energy balance parameters of the soil, the snowpack and the vegetation. Therefore several well accepted statistical methods, like root mean squared error, model efficiency or normalized mean average error will be used to compare the simulated and observed results and to point out the advantages and disadvantages of each particular SVAT model. Special attention will be paid to the differences in the model design and their influence on the reliability and accuracy of the simulated outputs.

The major objectives of this presentation will be the calibration of the models via the DREAM algorithm as well as to highlight the strengths and weaknesses of the particular model in simulating the processes in an Alpine environment and to point out where it is useful to employ complex physically based models and where a simple model produces significant results.