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Spatial variability of temperature for improved snowmelt forecasting

J. Eckart (1,2), D.E. Reusser (1), Prof. Dr. E. Zehe (1), Prof. Dr. C. Bernhofer (2)

(1) Institute of Geoecology, University of Potsdam, Germany (2) Institute of Hydrology and Meteorology, Technische Universität Dresden, Germany

The spatial and temporal variability of snowmelt in a catchment area depends on multiple processes. The heterogeneity of morphologic, vegetative and climatologic elements determines snow accumulation and snowmelt. Especially the spatial variability of temperature and radiation at the meso-scale has a significant influence on these processes. Therefore, temperature is a substantial input for hydrological modelling especially for snowmelt, but generally too few measurements are available in a catchment area for downscaling or regionalisation. A precise description of temperature can improve snow modelling and snowmelt forecasting.

We test whether the representation of the spatial pattern of temperature can be improved by geostatistical analysis. While ten climate stations in the vicinity of a 50 km^2 catchment constitutes a fairly dense network, the data is still insufficient for standard geostatic analysis. Generally, about 30 data points for each lag-class are required for variogram estimation. In order to increase the data base measurements were pooled over a time period of several hours. The suitability of this spatial information has been tested for different typical weather situations with snow melting. The results have also been compared with different standard interpolation methods.The advantage of this method is the use of geostatistic analysis with a few of measurements as an input for a hydrological model. A second advantage is the fast and automatic way of downscaling.

The effects of different spatially interpolated temperature patterns are evaluated with the hydrological response of the snow model (Wasim ETH I, Temperature index melt modelling). The results discussing the influence of spatial variability of temperature

on modelling of snowmelt events will be presented.