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Distributed precipitation corrections in Alpine areas for a real-time flood forecasting system

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This contribution presents a method for estimating spatial and temporal distributed precipitation correction factors. The approach is applied for a flood forecasting model in the Upper Enns and Upper Mur catchments in the Central Austrian Alps.

Precipitation exhibits a large spatio-temporal variability in Alpine areas. Additionally the density of the monitoring network is low and measurements are subjected to major errors. This can lead to significant deficits in stream flow simulations, e.g. for flood forecasting models. Therefore precipitation correction factors are frequently applied. These correction factors are however mostly applied for whole catchments in a lumped manor, neglecting, that the magnitude of precipitation errors are spatially distributed.

For the presented study a multiplicative linear correction model is therefore implemented, which enables a distribution of the correction factors as a function of elevation. The applied rainfall-runoff model COSERO is set up with a spatial resolution of 1x1km2. The correction of the rainfall pattern is thereby applied for every grid cell. To account for the local meteorological conditions, the correction model is derived for two elevation zones: (1) Valley floors to 2000 m a.s.l. and (2) above 2000 m a.s.l. to mountain peaks. Measurement errors also depend on the precipitation type, with higher magnitudes in winter months during snow fall. Therefore additionally separate correction factors for winter and summer months are estimated. The parameters for the correction model are estimated for every catchment based on independent station observations and observed and simulated runoff of the conceptual rainfall-runoff model. As driving input the INCA-precipitation fields of the Austrian Central Institute for Meteorology and Geodynamics (ZAMG) are used. Due to the mentioned errors, these precipitation fields are corrected according to the described method. The results show a significant improvement of the simulated runoff, not only concerning the long-term water balance and snow melt, but also the simulation of flood peaks.