Geophysical Research Abstracts
Vol. 15, EGU2013-11891, 2013
EGU General Assembly 2013

The role of seasonal recharge and catchment storage concepts for low flow modelling

Michael Stoelzle, Kerstin Stahl, and Markus Weiler
Chair of Hydrology, University of Freiburg, Freiburg, Germany (michael.stoelzle@hydrology.uni-freiburg.de)

In hydrological modeling storage-discharge relationships define low flow prediction. During rainless periods and when evapotranspiration is much smaller than discharge, discharge is solely a function of storage depletion. Models often use a given structure of reservoirs and outflow coefficients defining the storage-discharge relationship that are calibrated to fit the data. This study aims to vary model structures rather than parameters to systematically improve low flow modeling and system understanding for a range of different catchment properties. It also specifically investigates the role of seasonal storage variability together with different frameworks of conceptual storages (buckets) with different properties such as capacity, storage depletion and different storage cascades. We use the catchment-wide daily recharge derived from a physically-based and regional established spatially distributed SWAT model as input to a number of storage-discharge model frameworks in 25 meso-scale catchments. The simulations are systematically compared with baseflow as derived from observed streamflow records over several years. The catchments are all located in a humid climate and are partly snow-influenced but otherwise differ strongly in their catchment characteristics such as topography, geology, land cover, shape, etc. Generally, we found that at least two types of recharge regimes are distinguishable as starting point for a storage-low-flow model. The first type occurring in catchments with a high baseflow index (BFI) shows high recharge in winter season but none and only baseflow in summer. The other type (moderate BFI) shows a year-round direct link of recharge and outflow to the baseflow. Fundamentally different storage frameworks for these regimes are hence needed. Stratification of the modeling into moderate, wet, and dry years and different low flow seasonality will elucidate the temporal stability of the concepts and may allow an assessment of the catchments vulnerability to low flow in a climatic change context.