Geophysical Research Abstracts
Vol. 20, EGU2018-12158, 2018
EGU General Assembly 2018

Investigating the realism in simulated groundwater dynamics through field measurements.

Thomas Skaugen, Søren Nykjær Boje, and Knut Møen
Norwegian Water Resources and Energy Directorate, Hydrology, Oslo, Norway (ths@nve.no)

The tiny Muren catchment (7500 m2) near Oslo, Norway, is re-established as a research catchment by the Norwegian Water Resources and Energy Directorate. The catchment is forested with a layer of shallow till (< 1 m) covering bedrock. In 2017 the catchment was equipped for runoff and meteorological measurements together with 25 groundwater observation wells. The aim of this study is to investigate if simulated groundwater dynamics by the DDD (Distance Distribution Dynamics model) provide a realistic scenario of shallow groundwater dynamics. The DDD model is a rainfall-runoff model used operationally by the Norwegian Flood-Forecasting service at NVE. The DDD model has a 2-D representation of the subsurface and calculates the saturated soil moisture along a hillslope (representing the entire catchment) as a function of distance from the river network (RN). The, so far, very limited number of observed groundwater fluctuations at the 25 groundwater wells show variability in response, recession and timing to precipitation events. Wells located far away from the theoretical RN (provided by ARC GIS since the catchment is too small to have a perennial RN) show less response and recover more quickly than wells located close to the river network, which typically show a higher response and long recessions. We have run the DDD model for historical data for five different theoretical RN's, differing in the area it takes to create a channel (100 m2, 500 m2, 1000 m2, 2500 m2 and 5000 m2). We have extracted the groundwater fluctuations at each of the 25 locations of the groundwater wells in order to see if the simulated groundwater fluctuations exhibit the same characteristics as the observed. The input data is hourly precipitation and temperature for August 1987 - May 1988. In October 1987 an intense storm occurred in the area and several catchments in the region experienced 50-year floods. The simulated groundwater fluctuations do show the same characteristics as the observed in that locations close to the RN have higher response and longer recessions than locations farther away from the RN. This feature is especially pronounced for the RN using 5000 m2 to create channels. Moreover, we can observe that the timing of overland flow in DDD corresponds very well with observations of complete saturation from two groundwater observation wells that were active during that period. In the near future, we will have more groundwater and runoff data to study and analyse such problems as the timing of groundwater response and runoff as a function of catchment saturation, relations between runoff- and groundwater recession and many other captivating aspects of groundwater-surface water interactions.