Geophysical Research Abstracts
Vol. 20, EGU2018-11977, 2018
EGU General Assembly 2018


# Water balance dynamics of the constructed Chicken Creek catchment as influenced by 12 years of ecological development

Wolfgang Schaaf (1), Ina Pohle (2), Thomas Maurer (3), Werner Gerwin (4), Christoph Hinz (3), and Annika Badorreck (4)

(1) Soil Protection and Recultivation, Brandenburg University of Technology, Cottbus, Germany (wolfgang.schaaf@b-tu.de), (2) Environmental and Biochemical Sciences, The James Hutton Institute, Aberdeen/Scotland, UK, (3) Hydrology and Water Resources Management, Brandenburg University of Technology, Cottbus, Germany, (4) Research Centre Landscape Development and Mining Landscapes, Brandenburg University of Technology, Cottbus, Germany

Experimental catchments with well-known boundaries and characteristics may contribute valuable data to hydrological, critical zone and landscape evolution research. One of the most well-established and largest constructed catchments is the Chicken Creek catchment (6 ha area including a 0.4 ha pond, Brandenburg, Germany) representing an initial ecosystem undergoing a highly dynamic ecological development starting from clearly defined starting conditions. The water balance dynamics of the catchment was calculated using a simple mass balance approach to reveal the impact of ecological development during 12 years. Water storage in the catchment was calculated from a 3D-model of groundwater volumes, soil moisture measurements and water level recordings of the pond. The catchment water balance equation was resolved for evapotranspiration, the only part that was not measured directly. Due to the known boundary conditions and the inner structure of the catchment, we were able to quantify the different storage compartments and their role in hydrologic response. Our results indicate that for small catchments with a highly dynamic ecological development like the Chicken Creek, the knowledge about saturated and unsaturated storage volumes enables a good estimate and closure of the water balance using a rather simple approach, at least in annual resolution. We found a significant relationship between vegetation cover in the catchment and calculated ET. Time series of meteorological, hydrological, soil and vegetation data over 12 years enabled us to characterize the transient development of the catchment and to evaluate the effect of different feedback mechanisms on catchment hydrology. The dataset from the Chicken Creek catchment indicate at least three phases in ecosystem development, where initial abiotic feedbacks (e.g. erosion) were followed by more and more biotic controls (e.g. biological soil crusts, vegetation succession and growth). Data from Chicken Creek in high spatial and temporal resolution provide a valuable database underlining the high importance of abiotic/biotic feedback effects that change the hydrologic functioning and response of the catchment more than the water balance itself revealed and thus have to be included in catchment models.