Geophysical Research Abstracts
Vol. 18, EGU2016-540, 2016
EGU General Assembly 2016

Modelling the effects of land use changes on the streamflow of a peri-urban catchment in central Portugal

Saga Hävermark, Carla Sofia Santos Ferreira, Zahra Kalantari, and Giuliano Di Baldassarre
Sweden (sagahav@hotmail.com)

Many river basis around the world are rapidly changing together with societal development. Such developments may involve changes in land use, which in turn affect the surrounding environment in various ways. Since the start of industrialisation, the urban areas have extended worldwide. Urbanization can influence hydrological processes by decreasing evapotranspiration, infiltration and groundwater recharge as well as increasing runoff and overland flow. It is therefore of uttermost importance to understand the relationship between land use and hydrology. Although several studies have been investigating the impacts of urbanization on streamflow over the last decades, less is known on how urbanization affects hydrological processes in peri-urban areas, characterized by a complex mosaic of different land uses. This study aimed to model the impact of land use changes, specifically urbanization and commercial forest plantation, on the hydrological responses of the small Ribeira dos Covões peri-urban catchment (6,2 km2) located in central Portugal. The catchment has undergone rapid land use changes between 1958 and 2012 associated with the conversion of agricultural fields (cover area decreased from 48% to 4%) into woodland and urban areas, which increased from 44% to 56% and from 8% to 40%, respectively. For the study, the fully-distributed, physically-based modelling system MIKE SHE was used. The model was designed to examine both how past land use changes might have affected the streamflow and to investigate the impacts on hydrology of possible future scenarios, including a 50 %, 60 % and 70 % urban cover. To this end, a variety of data including daily rainfall since 1958 and forward, daily potential evapotranspiration from 2009 to 2013, monthly temperature averages from 1971 to 2013, land use for the years 1958, 1973, 1979, 1990, 1995, 2002, 2007 and 2012, streamflow from the hydrological years 2008 to 2013, catchment topography and soil types were used. The model was calibrated for the hydrological years 2008 to 2010 and validated for the three following years using streamflow data. The impact of future land use changes was analysed by investigating the impact of the size and location of the urban areas within the catchment. Modelling results are expected to support the decision making process in planning and developing new urban areas.