Geophysical Research Abstracts
Vol. 20, EGU2018-18562-1, 2018
EGU General Assembly 2018

Investigation of the influence of forest roads on flow paths and flow times in a small experimental catchment

Johannes Wesemann, Mathew Herrnegger, Josef Fürst, and Karsten Schulz

BOKU Vienna, Institute of Water Management, Hydrology and Hydraulic Engineering (IWHW), Wien, Austria (johannes.wesemann@boku.ac.at)

A high density road network causes an increased number of crossings between roads and flow paths and is therefore also influencing the corresponding drainage network. Especially in small headwater catchments this can have a significant influence on the flow paths, the flow time and the residence times of the water within the catchment. Further, this can lead to an increase of peak flow during flood events as has been shown in various studies. Nevertheless, the impact of the road network is difficult to quantify.

In this study, the influence of forest roads is investigated in the well monitored small scale experimental catchment "Rosalia" in Lower Austria, covering an area of about 2.2 km^2. Comprehensive knowledge has been collected on the forestry, climate, soils and hydrology of this watershed as an outcome of various research projects in the past, including acid rain studies, timber stock estimation with remote sensing techniques and greenhouse gas emission measurements from forest soils. The forest road network and its development has been documented since 1902 and its current state has been surveyed again, including all gullies and culverts. Two digital elevation models derived by LIDAR (laser scans) and with a cell size of 0.5m and 1m exist.

In order to quantify the impact of the road network in the catchment, the flow path lengths and the flow times are derived for two cases: (1) the current state of the catchment including the whole road network, gullies and culverts and the recent stream network; (2) the reconstructed historic catchment topography where all roads are being levelled out resulting in the original drainage network. For the latter case, the historic road and skid trail information is used and several interpolation techniques are applied to reconstruct the historic (natural) hillslope conditions. With the comparison of these two indicators, the changes uniquely caused by the forest road network can be determined.

This contribution should help to understand and quantify how anthropogenic modifications of the topography, such as forest roads, can influence the development and genesis of floods in headwater catchments and how these effects can be considered in an integrative flood risk management framework.