Geophysical Research Abstracts
Vol. 19, EGU2017-3470, 2017
EGU General Assembly 2017

Natural flood retention in mountain areas by forests and forest like short rotation coppices

Christian Reinhardt-Imjela, Achim Schulte, and Jens Hartwich
Department of Earth Sciences, Freie Universität Berlin, Berlin, Germany

Natural water retention is an important element of flood risk management in flood generating headwater areas in the low mountain ranges of Central Europe. In this context forests are of particular interest because of the high infiltration capacities of the soils and to increase water retention reforestation of agricultural land would be worthwhile. However competing claims for land use in intensely cultivated regions in Central Europe impede reforestation plans so the potential for a significant increase of natural water retention in forests is strongly limited. Nevertheless the development of innovative forms of land use and crop types opens new perspectives for a combination of agricultural land use with the water retention potential of forests. Recently the increasing demand for renewable energy resources leads to the cultivation of fast growing poplar and willow hybrids on agricultural land in short rotation coppices (SRC). Harvested in cycles of three to six years the wood from the plantations can be used as wood chips for heat and electricity production in specialized power plants. With short rotation plantations a crop type is established on arable land which is similar to forests so that an improvement of water retention can be expected.
To what extend SRC may contribute to flood attenuation in headwater areas is investigated for the Chemnitzbach watershed (48 km^2) in the Eastern Ore Mountains (Free State of Saxony, Germany), a low mountain range which is an important source of flood runoff in the Elbe basin. The study is based on a rainfall-runoff model of flood events using the conceptual modelling system NASIM. First results reveal a significant reduction of the flood peaks after the implementation of short rotation coppices. However the effect strongly depends on two factors. The first factor is the availability of areas for the plantations. For a substantial impact on the watershed scale large areas are required and with decreasing percentages of SRC the water retention effect decreases. The second factor is the hydraulic behavior of soils. The initial properties of the SRC soils (pore volume, field capacity, hydraulic conductivity etc.) shortly after implementation of the plantation can be assumed to be similar to arable land if there is no prior conditioning such as deep tilling. However with increasing age of the plantation the properties are expected to converge to forest soils with their higher water retention capacities. Accordingly the infiltration potentials of the plantation strongly depends on the development of soil properties underneath.
In general it can be concluded that short rotation coppices cannot solve flood problems in mountain areas solely. However together with other natural and distributed measures (e.g. retention basins, reforestation, conservation tillage etc.) they can be interesting elements of flood retention strategies in mountain areas.