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Investigation of the spatial distribution of runoff generation and soil erosion processes by means of experimental methods and field mapping

Verena Butzen (1), Manuel Seeger (2), Markus Casper (1), Stefan Wirtz (1), and Johannes B. Ries (1)

(1) Trier University, Dep. of Physical Geography, Trier, Germany (butzen@uni-trier.de), (2) Wageningen University, Dep. of Land Degradation and Development, Wageningen, The Netherlands

The contribution of forested areas to the flood and erosion dynamics is usually regarded to be negligible under humid climate conditions in Central Europe. Nevertheless, also forest areas can be sources for overland flow and sediment, particularly the artificial linear structures like forest roads and harvester tracks, or other human impacts like water engineering measures.
A second factor that is usually disregarded in the context of overland flow generation in forests, is the water repellency of the soil surface, that can pre-eminently be observed under rather dry soil moisture conditions in summer. Especially facing the expected climate change, it is becoming more and more important to get a spatially distributed, quantitative understanding of the processes occurring in forested catchments.
The EU-INTERREG-IVb-project ForeStClim (Transnational Forestry Management Strategies in Response to Regional Climate Change Impacts) aims at the development of forestry management strategies in order to secure the future economic stability of forestry in North-West-Europe and an efficient protection of forest ecosystems. In the framework of the ForeStClim-project a combination of experimental methods has been applied for the investigation of the spatial variation and intensity of overland flow generation and soil erosion processes in three forested low mountain range catchments in Luxembourg and in Rhineland-Palatinate, Germany.
The applied experimental methods are a small-plot scale rainfall simulator and rill erosion experiments. By means of the plot scale rainfall simulator, in altogether 70 rainfall simulations, overland flow generation and suspended sediment load have been determined. The rill erosion experiments are used for a quantification of the efficiency of the studied harvester tracks and rills as flow paths for concentrated overland flow, as well as for a quantification of the erosion in these linear structures. The rill erosion experiments enable a comparison of different erosion processes and the erosion amounts produced in the rill or track for a defined runoff inflow. The hydrological and erosional response of the rill catchment is tested by means of the rainfall simulation experiments and infiltration measurements.
By means of all these experimental measurements in combination with a detailed mapping of soils and geomorpho-dynamics, it becomes possible to determine the spatial distribution of overland-flow generating areas and the occurrence of possible soil erosion processes in the study areas. The results of the experimental measurements and mappings will be used for the development of improved forest management strategies in adaptation to climate change.