# HYDROCHEMICAL LOAD IN A SMALL RIVER FOLLOWING HEAVY RAIN EVENTS

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## Introduction

European Water Framework Directive aims at maintaining and improving the aquatic environment in the Community. The solution of related problems requires detailed knowledge of the meteorological, hydrological and geomorphological conditions and processes. In agricultural used regions erosion and suspended load play an important role.

Until now there are lacks in knowledge about the complicated process-chain of particle displacement, transport pathways and suspended load as well as the effect of suspended particles on water organisms. The predicted climate change leads to more extremes, including higher rainfall intensities, resulting in a worsening of the problem of erosion and sediment load in the rivers. Soil loss and particle concentration in the river can be reduced by different measures, such as year-round soil cover through appropriate management strategies (e.g. interim fruit cultivation, direct sowing, conservation tillage), or through land use changes (e.g. conversion of farmland to grassland or forest).

## Methods

The investigation aims on the identification, analysis and quantification of abovementioned processes and problems. Thus the catchment of the Landwasser (27 $km^2$) was chosen as research area. The mean discharge of the river Landwasser is 313 $dm^3 \cdot s^{-1}$. This catchment is part of the Nysa-basin. It is mainly agricultural used with partly steep slopes and the river bed is strongly influenced by human activities. The region is covered by silty soils having a high erosion potential.

As a first step the risk areas of erosion and the pathways and transportation routes have to be identified with GIS, combined with a model (WBS). In the stream discharge, suspended load and turbidity are measured. To detect the dynamic of the suspended particle transport, an automatic water sampler was installed. Samples are taken controlled by discharge (e.g. every 500 $m^3$). Afterwards the samples are analyzed in the lab. Additionally all meteorological elements are recorded hourly. Precipitation is measured in 5 minutes time step. At last some models are used (e.g. ICECREAM and EROSION 2D) for simulation and forecasting studies, in order to gain insights how landscape structure and land use control matter cycles.

## Results and discussion

The river discharge reacts very quickly on precipitation events. Figure 1 shows one example from May 2007, with a maximum precipitation intensity of 13.6 mm in 10 minutes. This paper focuses on the distribution of selected measured chemical parameters (e.g. suspended load, nitrate, copper,…) depending on discharge.

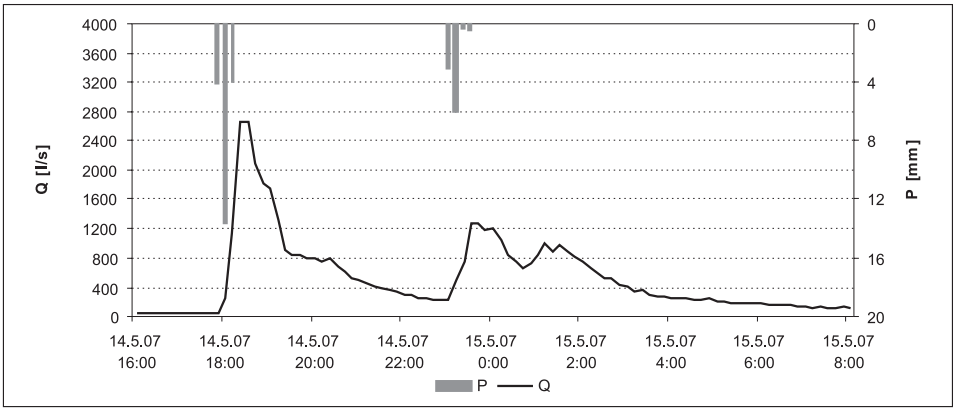


Figure 1. Precipitation and discharge during the heavy rain event May 14th/15th 2007 (first event 21.7 mm, second one 10.0 mm)

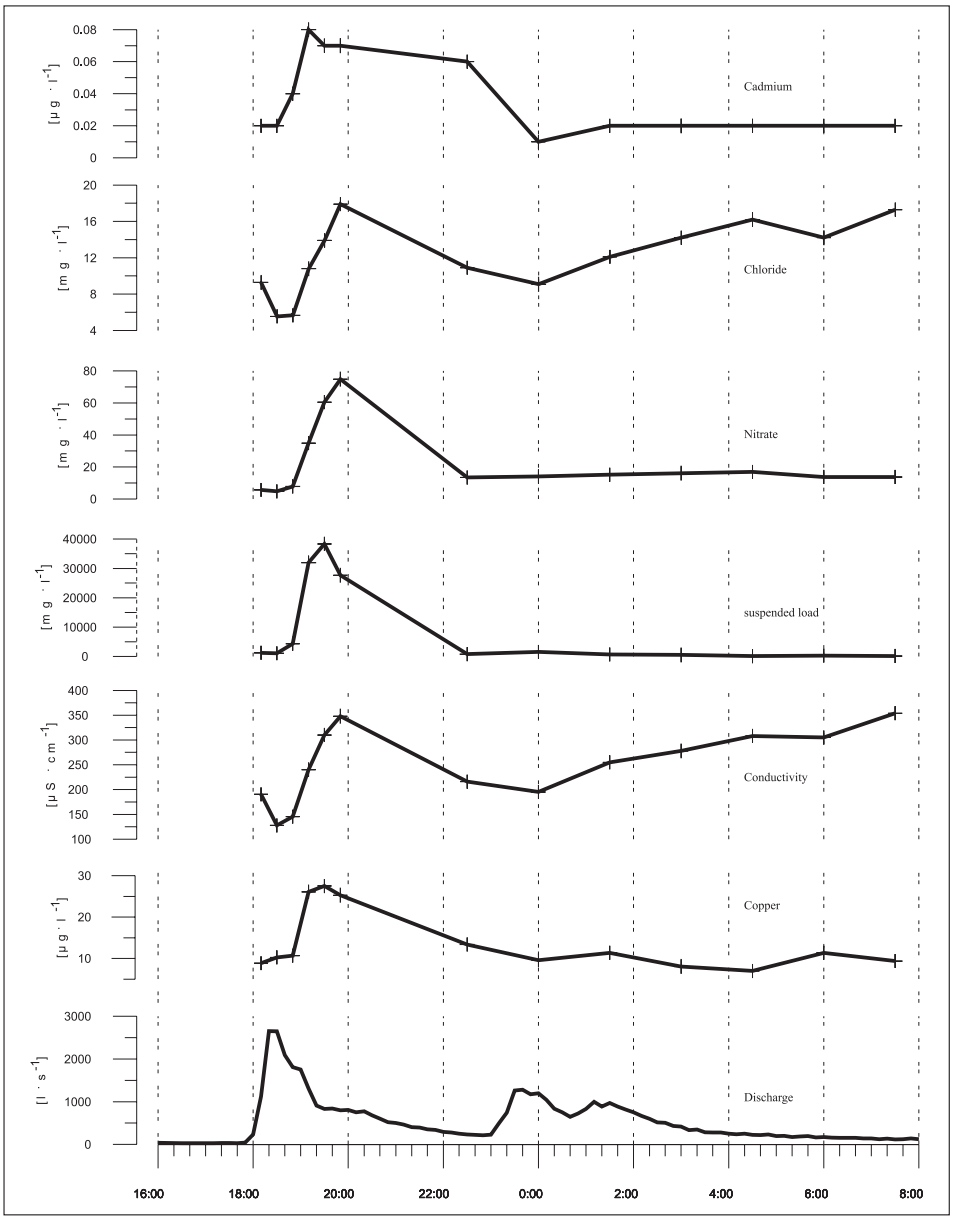


Figure 2. Courses of exemplary hydrochemical components during the flood wave following the heavy rain event from May 14th/15th 2007

Figure 2 shows some exemplary concentration courses during the heavy rain event from Figure 1. The mass transport is delayed related to the discharge. During this period the soil was only partly cover by vegetation because of the big portion of maize fields. Therefore, quick surface runoff lead to soil loss and high concentration of suspended solid particles in the river. The maximum value of 38 $g \cdot dm^{-3}$ occurred one hour after the discharge maximum (Figure 2). The first flood wave transported 200 tons of suspended particles out of the catchment.

Concentration of Chloride and Conductivity are connected. Increasing chloride concentration caused increasing conductivity. With increasing water level chloride seemed to be diluted.

Nitrate concentration is delayed to the suspended sediment concentration maximum, because it is released by agricultural drainage systems.

Heavy metals (copper, cadmium) reached their concentration maximum before all other components. They are removed from streets and urban areas close to the river.

The analysis of further rain events showed, that some parameters change their relations during the vegetation period (e.g. nitrate and suspended load), because of plant uptake and increasing soil coverage. Further investigations to gain detailed knowledge of the transport processes within the catchment are necessary.