Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08487, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08487
EGU General Assembly 2008

Flood effects on contaminant release in alluvial top soils – Field studies

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Flood events may enhance the mobility of particles and contaminants accumulated in floodplain soils und thus pose a severe thread for river and groundwater resources.

To elucidate the processes which control the contaminant release under submerged conditions we run undisturbed packed column and zero-tension field lysimeter experiments.

The lysimeters are located at the Muldenstein and the Schönberg Deich site in the Elbe catchment, Germany. Sampling takes place before, if possible during flood, and after flood events. The seepage water was analysed for suspended particles, DOC (dissolved organic carbon), turbidity, PAHs (polycyclic aromatic hydrocarbons), pH, EC (electric conductivity), heavy metals and alkaline earth elements.

At both sites, we found increased PAH release for spring flood events (duration: more than 30 days). PAHs concentration increased by a factor of from 0.05 μg l^{-1} before flood to a concentration of 0.2 μg l^{-1} after flood. With respect to the release in the operationally defined dissolved and particle fractions, the higher condensed PAHs ($>$ 3-ring PAHs) are found in the fraction > 0.7 μm. The results of the lysimeter replicates are in close agreement. Increased release was also found for DOC and TOC for both sampling sites for the long inundation period, while shorter flood periods (5 days) had no effect. With regard to the release of iron and manganese, we observed an increased release of manganese of at the Muldenstein site, while at the Schönberg Deich iron

was more important

The most important factor for the excess of the released materials seems to be the duration of the inundation. Other factors, like temperature and the frequency of flood events are of minor importance. Thus, a long flood period of about 2 month in wintertime might have another impact on contaminant release than a 2-week flood during spring and summertime.

Our studies contribute to a better understanding of the release mechanisms of organic and inorganic contaminants driven by flood events of different duration.

The risk of groundwater and river pollution due to microbial mediated reductive processes has to be considered in the flood management of river-catchment systems.