Geophysical Research Abstracts, Vol. 7, 02786, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02786

Effects of mobile sorbents on the release of polycyclic aromatic hydrocarbons as revealed from column and lysimeter experiments

S. Jann, K.U. Totsche and I. Kögel-Knabner

Lehrstuhl für Bodenkunde, Department für Ökologie, Wissenschaftszentrum Weihenstephan für Ernährung, Landnutzung und Umwelt, Technische Universität München, 85350 Freising-Weihenstephan; sjann@wzw.tum.de

Release and transport of polycyclic aromatic hydrocarbons (PAH) are affected by mobile sorbents like dissolved and colloidal phase organic matter, inorganic colloids and suspended particles. The mobilisation and transport of particle-associated PAH at contaminated sites result in a redistribution of PAH in the unsaturated zone and might even reach groundwater in considerable amounts. A qualitative and quantitative understanding of the factors which control the mobilisation and transport of mobile sorbents is therefore essential for the risk assessment at contaminated sites. We investigated the release of PAH and mobile sorbents up to a size of 200 μm from contaminated gravelly soil materials with saturated column experiments and under natural conditions with medium sized lysimeters. For the column experiments we apply an experimental design which comprises two columns run at two different flow velocities with multiple stop-flow events to observe possible kinetic limitations. Column effluent fractions and seepage water were analyzed for the 16 EPA-PAH in two particle size fractions ($<$0.7 μm and 0.7-200 μm), dissolved organic carbon (DOC), pH, electrical conductivity and turbidity. The column experiments showed that the release of both the PAH in the fraction $<$0.7 μm and DOC was found to be highly rate limited indicated by their marked response to both the flow velocity and the duration of the stop-flows. Measured PAH concentrations in this fraction differed markedly from those calculated by Raoult's law: Equilibrium dissolution seems to be of minor importance for the studied materials. Within the fraction 0.7-200 μm, PAH release was found to be independent of the flow velocity and the imposed stop flow events. Overall PAH exported from the columns was dominated by the smaller size fraction, indicating the importance of

these materials for PAH redistribution in contaminated soil. Under natural conditions, the PAH export is dominated by fraction 0.7-200 μm. Extreme release events occurred during winter 2002/03 and 2003/04. Responsible are most likely freezing and thawing cycles which results in the formation of particles and associated PAH exported from the lysimeter at the onset of the thawing. The export of PAH from the studied contaminated soils seems to be strongly coupled to the mobility of colloids and suspended particles and has therefore to be taken into account in the risk assessment procedure at contaminated sites.