EGU2020-5336
https://doi.org/10.5194/egusphere-egu2020-5336
EGU General Assembly 2020

An experiment to assess the influence of urban pavements on biocide leaching from facades into urban soil and groundwater

Felicia Linke and Jens Lange
University of Freiburg , Chair of Hydrology , Germany (felicia.linke@hydrology.uni-freiburg.de)

Biocides added to facade renders and paints prevent algae and fungi growing at conventional buildings. During rain events biocides leach from facades into the urban environment and its compartments i.e. soil, surface water and groundwater. In many cases polluted façade runoff reaches partly sealed pavements and a major part infiltrates. Transport and transformation processes of biocides below these pavements are largely unknown. It may be hypothesized that concentrated infiltration in joints surrounding paving stones may enhance water percolation and accelerate solute transport. This would mean that partly sealed pavements beneath building facades are hotspots for the entry of biocides into groundwater. This study aims at testing this hypothesis using an experimental mass balance approach.

Five weighable lysimeters in freestanding boxes represent a small-scale section of an urban environment. Three lysimeter have a sealed or partly sealed plaster surface (concrete stones, granite stones with sand joints, and grass paver). The other two lysimeter represent unsealed surfaces, one of them contains a 10cm soil layer with grass cover. The fifth lysimeter acts as a control and has a 40cm layer of filter gravel. Below all surface layers there is 20cm of crushed sand and 10cm of filter gravel. This setup follows typical guidelines of urban construction.

A hose with holes represents the linear leachate of a façade during a rain event. In pre-tests isotopically depleted (collected snowmelt) and enriched (spiked with a heavy standard) water serves to illustrate differences between areal and linear infiltration. Then Terbutryn dissolved in water acts as the main contaminant. It is a biocidal ingredient of a variety of paints and renders. Additional tracers such as bromide, uranine and sulforhodamine B help to illustrate the solute transport inside the lysimeters. Brilliant blue is used to visualize infiltration patterns.

For the experiment the boxes are saturated to field capacity. Pulses of the Terbutryn and tracer solution are poured on the gutter to represent a series of rainfall events with façade leaching. The entire percolate is collected at the bottom of the lysimeter and water samples are taken at regular intervals. After the experiment, the lysimeter matrices are sampled for Terbutryn, three prominent transformation products and for the different tracers. In parallel, physico-chemical soil properties are assessed. This experiment will provide new insights into processes that promote biocide leaching from building facades into urban groundwater.