EGU23-7699, updated on 23 Apr 2024
https://doi.org/10.5194/egusphere-egu23-7699
EGU General Assembly 2023

Pesticide transformation product occurrences in surface waters as ground water pollution risk indicators in the context of an extended residence time aquifer

Tom Gallé[1], Michael Bayerle[1], Denis Pittois[1], Viola Huck[1], and Julien Farlin[2]
[1]Luxembourg Institute of Science and Technology, ERIN Dept., Belvaux, GrD of Luxembourg (tom.galle@list.lu)
[2]Water management administration Luxembourg, ESEP, Esch-sur-Alzette, GrD of Luxembourg (julien.farlin@eau.etat.lu)

Luxembourgish groundwater aquifers have recently been impacted by high concentrations of several pesticide transformation products (TP) that led to regulatory issues for about 1/3 of the drinking water supplies (Luxembourg considers all transformation products to be relevant and applies the 100 ng/L legal threshold). The consequent application restrictions or complete bans of certain pesticides triggered switches in compound uses in several cultures. A leaching risk analysis had been conducted to orient agricultural counselling on the least impacting parent compounds and transformation products. However, since the leaching simulations relied on literature environmental property data of the pesticides (like fraction of TP generated), there was some uncertainty on the true impact of the identified TPs. Residence times of groundwaters in the main aquifer spanning on average between 10 and 20 years (with proportional recovery times once these waters are contaminated), a faster validation approach was needed. The hypothesis was established that the interflow component in surface waters would be a good indicator to estimate the amount of transformation products available for groundwater leaching. In that perspective passive sampling campaigns were established on four river basins of distinct hydrogeology to quantify the masses of parent compounds and transformation products transported during an entire year and supported by grab sampling in the descending limbs of seasonal flood waves. Additional parameters included conductivity, DOC, Abs280 and macro-anions. All the predicted transformation products were identified and their occurrence varied in amount and timing in the different catchments according to their application, metabolization in soils and hydrogeological setting. This contribution discusses the influences of spatial use variability and hydrological connectivity of agricultural source plots to the magnitude of the occurrences as well as its potential link to the leaching modelling and its parametrization.