Geophysical Research Abstracts
Vol. 15, EGU2013-3026, 2013
EGU General Assembly 2013

Combining chemical and isotopic measurements to estimate pesticide degradation rates in a fractured-rock aquifer

Julien Farlin (1), Tom Gallé (1), Michael Bayerle (1), Denis Pittois (1), Hassanya El-Khabbaz (1), Kathrin Schreglmann (2), Martina Höche (2), and Martin Elsner (2)

(1) CRP Henri Tudor, CRTE, Esch-sur-Alzette, Luxembourg, (2) Helmholtz Centre, Institute of Groundwater Ecology, Munich, Germany

Encouraged by new regulatory requirements for pesticide registration and authorization, the transport and environmental fate of these compounds in the different environmental compartments has been studied extensively. Degradation rates vary widely depending on hydraulic and chemical characteristics, with the strongest degradation usually occuring in the topsoil. Nonetheless, significant pesticide attenuation may still take place during transport in the aquifer, since residence times are generally much longer than in the soil.
Ideally, pesticide transformation in the aquifer needs to be determined under real field conditions. Mass balance calculations however are complicated by the fact that the initial pesticide mass leached from the soil is often not known precisely enough.
In this study, isotopic and classical pesticide concentration measurements were combined with groundwater dating techniques to assess the degradation rate of atrazine and its metabolite desethylatrazine in a fractured sandstone. The mass balance problem was solved by introducing the desethylatrazine to atrazine ratio, a relative measure which was used to quantify the advancement of atrazine degradation with increasing transport time in the subsurface. The extent of transformation of the parent compound was finally estimated from the shift in the isotopic signal between soil application and the outlet of the groundwater system.