Geophysical Research Abstracts
Vol. 16, EGU2014-3931, 2014
EGU General Assembly 2014

Simulation of pesticide dissipation in soil at the catchment scale over 23 years

Wilfried Queyrel (1), Habets Florence (1), Blanchoud Hélène (1), Schott Céline (2), and Nicola Laurine (2)

(1) UMR Métis, EPHE, Pierre and Marie Curie University, Paris,France (wilfried.queyrel@upmc.fr), (2) SAD, INRA, Mirecourt, France

Pesticide applications lead to contamination risks of environmental compartments causing harmful effects on water resource used for drinking water. Pesticide fate modeling is assumed to be a relevant approach to study pesticide dissipation at the catchment scale. Simulations of five herbicides (atrazine, simazine, isoproturon, chlortoluron, metolachor) and one metabolite (DEA) were carried out with the crop model STICS over a 23-year period (1990-2012). The model application was performed using real agricultural practices over a small rural catchment (104 km^2) located at 60km east from Paris (France). Model applications were established for two crops: wheat and maize.

The objectives of the study were i) to highlight the main processes implied in pesticide fate and transfer at long-term; ii) to assess the influence of dynamics of the remaining mass of pesticide in soil on transfer; iii) to determine the most sensitive parameters related to pesticide losses by leaching over a 23-year period.

The simulated data related to crop yield, water transfer, nitrates and pesticide concentrations were first compared to observations over the 23-year period, when measurements were available at the catchment scale. Then, the evaluation of the main processes related to pesticide fate and transfer was performed using long-term simulations at a yearly time step and monthly average variations. Analyses of the monthly average variations were oriented on the impact of pesticide application, water transfer and pesticide transformation on pesticide leaching. The evolution of the remaining mass of pesticide in soil, including the mobile phase (the liquid phase) and non-mobile (adsorbed at equilibrium and non-equilibrium), was studied to evaluate the impact of pesticide stored in soil on the fraction available for leaching. Finally, a sensitivity test was performed to evaluate the more sensitive parameters regarding the remaining mass of pesticide in soil and leaching.

The findings of the study show that the dynamic of the remaining mass of pesticide in soil is a relevant issue to understand pesticide dissipation at long term. Attention must be paid on parameters influencing sorption and availability of the pesticide for leaching.

To conclude, the significant discrepancies in the simulated pesticide leaching for the two types of crops (maize and wheat) highlight the interest of using a crop model to simulate the fate of pesticides at the catchment scale.