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Geophysical Research Abstracts
Vol. 14, EGU2012-10445, 2012
EGU General Assembly 2012

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Abstract

In France, agriculture uses large quantities of fertilizer and pesticides. Water contamination by pesticides is highlighted by monitoring networks, at local and national levels. Control and reduction of contamination are major issues, for the protection of drinking water resources and aquatic ecosystems. Thus, understanding and quantifying the mechanisms involved in mobilization, transfer and dissipation of these substances can help to perform risk of water contamination diagnosis, and to estimate the effectiveness of corrective solutions.

In this context, landscape elements, like buffer zones, can be an effective way to reduce diffuse contamination of pesticides carried by surface runoff. They protect the water ressources of the drift of the products applied to crops and contribute to the reduction of the transfer of pesticides in surface runoff from the plots to the river. We are interested in our study to the vegetative filter strips.

The main objective of this thesis is to develop a model simulating the processes governing the transfer and dissipation of pesticides from plots to surface water, on surface and subsurface, along a slope. This will be done by taking into account the influence of vegetative filter strips between plots and rivers on the transfer, by changing the flow paths and retention time of these products via several mechanisms (infiltration, filtration of runoff -sedimentation of MES-, adsorption and degradation of products on the surface of the vegetative filter strips or infiltrated).

Several models describing the mechanisms of transfer of water and solutes (sometimes) at a hillslope scale exist, in particular : POLA (Pinheiro and al., 1995), Openfluid (LISAH), J2000-JAMS (Krause and al., 2006), CatFlow (Zehe and al., 2000), tRIBS (Ivanov and al., 2004), Cathy 3D (Bixio and al., 2000) and CMF (Kraft and al., 2011). It was decided to choose a spatially distributed and object-oriented model, allowing to couple hydrological processes occuring inside and between lanscape elements, with an adapted level of complexity. This led us to Catchment Modelling Framework (CMF), which fills these criteria. On top of that, structure of this model makes it possible to integrate buffer zones and pesticides behaviour simulation ; more, it needs data which are available on our study site.

This hillslope model will be tested on the Morcille site, in the Beaujolais area (France) which is one of the sites monitored by the non point source pollution team of Irstea in Lyon, and for data on surface and subsurface fluxes is available.