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Isoproturon and metribuzin migration in a silt loam soil under different land uses : unsaturated soil column displacement studies

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Infiltration of soluble pesticides in buffer zones such as grassed strips and forested areas is a major mechanism explaining their reduction in run off waters from farm fields to surface waters. The changes in the land use of a soil intensively cropped turning to permanent grassland or forest induce modifications in soil structure, porosity, organic matter status and microbial activity. To assess the impact of these modifications on the multiple processes affecting pesticides transport, a series of displacement experiments of a water tracer (bromide) and two herbicides (isoproturon and metribuzin) were performed on undisturbed cores under steady-state unsaturated conditions. The cores were sampled on a unique site under conventional wheat/maize rotation, 10 years old grassed strip and 80 years old oak/chestnut forest. All percolation experiments were performed at a single flow regime under rainfall simulation (3 $mm.h^{-1}$). Differences in the transport of bromide and of both herbicides were found between the different land uses. Similar mobility of the two herbicides was found between the grassed strip and cultivated soils while mobility was reduced in the forest soil. In all cases, isoproturon was significantly less mobile and less persistent than metribuzin. The moment analysis of the experimental breakthrough curves of bromide and herbicides provided an interested tool to identify the presence of physical and chemical non-equilibrium processes during the herbicides transport but did not

allow to identify the nature of these processes. A similar degree of physical non equilibrium transport for the cropped and grassland soil columns with a less intense degree of physical non-equilibrium transport - up to physical equilibrium transport - for the forest soil columns and chemical non-equilibrium transport for the three land uses were suggested. A furthermodelling analysis using the multi-process transport model of HYDRUS-1D confirmed the moment analysis results and allowed to identify the nature of the multiple processes. The dual-porosity type model was found to describe correctly the bromide data and the two-site sorption type model was used to model the herbicides data.