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In situ modeling of PAH dynamics in agricultural soils amended with composts using the “VSOIL” platform

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Numerous studies have shown the presence of organic pollutants (OPs) in composts. Compost application in agricultural soil generates flux of OPs and among them polycyclic aromatic hydrocarbons (PAHs). A potential accumulation of PAHs in soils from successive compost applications could imply risks to environment. To explore and design scenarios that help land managers in their impact evaluations when composts are added in soils, there is a need to a new generation of models built from multi-modules that mimic the whole interactions between the different processes describing OP dynamic in soil. Our work is based on the implementation of an interdisciplinary global model for PAHs in soil by coupling modules describing the major physical, biochemical and biological processes influencing the fate of PAHs in soil, with modules that simulate water transfer, heat transfer, solute transport, and organic matter transformation under climatic conditions. The coupling is being facilitated by the «VSOIL» modeling platform. The steps of our modelling study are the following: 1) calibrate the field model using parameters previously estimated in laboratory completed with field data on a short period, 2) test the simulations using field experimental data, 3) build scenarios to explore the impact of PAHs accumulation in a long term (40 years). Our results show that the model can adequately predict the fate of PAHs in soil and can contribute to clarify some of unexplored aspects regarding the behavior of PAHs in soil like their mineralization and stabilization. Scenarios that predict the dynamic of PAHs in soil at long terms show a low PAH accumulation in soil after 40 years due to a high sequestration of the PAH in soils that is slightly higher for municipal solid waste composts than for green waste sludge composts.