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Improvement of a simplified subsurface drainage simulation model

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The general purpose of the study is the quantification of the influence of landscape management on water resources and water quality. Subsurface drainage is a common agricultural practice, and is recognized to influence strongly catchment hydrology.

A simplified model for simulating subsurface drainage at the field scale was developed. It relies on two submodules, which were recoded on the basis of already existing models. Submodule SIDRA simulates water flow in the saturated zone through the Boussinesq equation. Its outputs are the water table elevation at mid-drain spacing and the unitary drain flow. Submodule SIRUP handles the vadose zone and allows computation of surface runoff and recharge to the water table, using a capacitive-based approach.

SIDRA and SIRUP can be used either separately or coupled together. Both were previously evaluated independently against field data.

In order to study more accurately the behaviour of both models and evaluate their coupling, comparative simulations between the SIDRA+SIRUP modelling system and the Hydrus-2D software were performed on appropriate scenarios.

The addition of SIRUP improves the quality of simulations, although SIDRA alone gives satisfactory results. Peak flows and water table elevation are well reproduced. Yet slight modifications of the SIRUP submodule lead to more accurate results for drainage recession tails. The next step of the study will be the addition of a solute transport submodule and the test of the resulting coupled model against field data.