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Influence of soil spatial variability on surface and subsurface flow at a vegetative buffer strip scale.

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The objective of this study is to evaluate the influence of soil hydrodynamic characteristics variability on surface and subsurface flow at a vegetative buffer strip scale, using mecanistic modeling. Cathy (CATchment HYdrology, Camporese et al. 2010) is a research physically based model able to simulate coupled surface/subsurface flow. The evaluation of soil hydrodynamic characteristics variability is based essentially on saturated hydraulic conductivity because of its large spatial variability in the 3 dimensions and its important influence on flow pathways, as well as its high influence on the model output variables. After testing the model sensitivity to some input variables, to the boundary conditions and to the mesh definition, the work focuses on hydraulic conductivity parametrization. The study was first conducted with uniform (by horizons) conductivity domains based on field measurements. In a second step, heterogeneous fields were generated by a statistical tool which allows the user to choose the statistical law (in this case, lognormal or Gauss), the hydraulic conductivity auto-correlation length and the possibility to condition the fields with measured points. With all these different ways to represent spatial variability of hydraulic conductivity, model simulated surface and subsurface fluxes consistent with datasets from artificial run-off experiments on an French wineyard hillslope (Morcille catchment, Beaujolais, France). Model simulations are evaluated and compared to observations on several criteria : consistency, stability, interaction with water table, etc...