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Can we predict the effects of soil structure on water flow and solute transport?

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Experimental research has demonstrated the link between observable soil morphology and structure and rapid non-equilibrium water flow and solute transport. Although models have been developed that can deal with flow and transport in structural macropores, their predictive application has been hampered by a lack of suitable parameterisation methodologies.

This presentation introduces a 'model-independent' soil classification scheme, the aim of which is to provide a simple but realistic framework for predictive modelling of the impacts of soil structure on macropore flow and transport in the unsaturated zone. The scheme is based on both qualitative and quantitative analyses ('classification trees') of the site and soil factors affecting soil aggregation and the abundance of anecic earthworms. The scheme takes the form of a 'decision-tree' that classifies any soil horizon into one of four classes with respect to susceptibility to macropore flow (none, low, medium or high). The scheme only requires easily available soil survey data, and can therefore be used to support model-specific parameterisation algorithms based on simple 'class' pedotransfer functions.

In this presentation, the rationale underlying the proposed scheme is described and some preliminary results of validation tests using two different datasets (solute breakthrough curves, near-saturated hydraulic conductivity) are also presented.