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# Is macropore flow predictable?

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In recent years, several models which include treatments of macropore flow and transport processes have been developed. Dual-permeability models divide the total soil pore space into one part characterised by a large storage capacity and small flow capacity (soil matrix) and another part (macropores) which has a small storage capacity and a large flow capacity. This type of model has shown considerable promise in recent field tests, and is starting to be used for management purposes. For example, the most widely used and tested dual-permeability model (MACRO) is one of four pesticide leaching models recommended for use in EU registration procedures. Nevertheless, there is still resistance to the widespread adoption of macropore flow models in the policy and management arena even though the critical importance of these processes for contaminant transport is generally acknowledged. One important reason for this is the general lack of acceptable and reliable methods for estimating model parameters regulating macropore flow, especially for purely predictive applications, when calibration is not a viable option.

In this paper, we investigate the extent to which macropore flow might be predictable, presenting the results of an attempt to derive a pedotransfer function for macropore flow parameters in MACRO. We applied an inverse modelling technique (the global search method, SUFI) to the results of tracer breakthrough experiments carried out on microlysimeters taken from a range of tilled arable topsoils in Sweden. The results demonstrate that for these specific agro-pedological conditions, the soil texture (geometric mean particle diameter) and the organic carbon content exert a strong control on the degree of macropore flow and transport, as expressed in the transfer coefficient regulating mass exchange between the flow regions.