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Parameter identification in a dual-permeability model

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Widespread use of dual-permeability solute transport models has been hampered by their greater parameter requirement compared to single permeability models. Furthermore, some of the additional parameters are difficult or impossible to measure directly. Therefore, inverse methods for parameter identification have to be applied. The objective was to test how the identifiability of key parameters regulating preferential flow depends on data availability. Sequential Uncertainty Fitting (SUFI), Generalised Uncertainty Estimation (GLUE) and the Parameter Identification Method based on the Localisation of Information (PIMLI) were used to that end. All three methods are designed to take parameter uncertainty into account. Results from an application of SUFI and GLUE to high quality field data show that both resident and effluent concentrations on both bromide and the weakly sorbed pesticide bentazone were needed to get highly conditioned parameters. Even with a comprehensive data set, large uncertainties remain, especially for the mass exchange coefficient in the topsoil. High time resolution data from tracer microlysimeter experiments proved to be sufficient for conditioning of the mass exchange coefficient. The kinematic exponent controlling macropore flow could not be identified, probably due to correlation with the macroporosity. Preliminary results using artificial data indicate that optimised microlysimeter experiments may contain enough information to accurately constrain the most sensitive parameters for accumulated pesticide leaching.