基于GLUE 方法的饱和多孔介质中溶质运移模型参数不确定性分析

Parameter uncertainty analysis of solute transport in saturated porous media based on GLUE method

中文关键词：GLUE方法　溶质运移模型　参数　不确定性　区域敏感度

英文关键词：GLUE method　solute transport models　parameter　uncertainty　regionalized sensitivity

基金项目：

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中文摘要：

　　模型参数的不确定性分析是模型不确定性研究的重要内容之一。本文以示踪剂Br和反应性溶质Cu在石英砂中的运移为例，采用GLUE方法探讨了多孔介质中溶质运移模型参数的不确定性。研究结果表明，仅对水力学参数θ_s和λ进行识别时，θ_s和λ的可识别性较强。对耦合Freundlich等温吸附的模型参数进行识别时，由于参数间的相互作用，θ_s和λ的可识别性降低；吸附特性参数k_F的后验分布基本呈均匀分布，可识别性较差，吸附特性参数β、ω、f 的取值区间则相对收敛，可识别性较强。K-S 检验结果表明，参数区域敏感度由高到底的排序为f、ω、β、k_F、λ、θ_s，主要是因为石英砂对Cu的吸附以动力学反应为主，而f 和ω是与动力学吸附反应相关的两个参数。上述结论有助于加深对溶质运移模型参数的理解和提高模型预测的可靠性。

英文摘要：

　　Parameter is one of the key roles in analyzing model uncertainty. In this paper the GLUE method was employed to discuss parameter uncertainty of solute transport models, with the tracer Br and reactive solute Cu transport in quartz sand column as an example. The results show that when only θ_s and λ were optimized the uncertainty was low. The narrowed ranges of θ_s and λ were then used to analyse the uncertainty in the identification of parameters in CDE coupled with Freundlich adsorption. The analysis resulted in a large uncertainty in θ_s, λ, k_F and small uncertainty in β, ω, f. The uncertainty of θ_s and λ were increased than before for the correlation of parameters θ_s, λ, k_F, β, ω, f. Regional sensitivity of these parameters in non-ascending order were f, ω, β, k_F, λ and θ_s as a result of that the sorption of Cu to quartz sand was kinetic, and f, ω were both closely related to the non-equilibrium adsorptive reaction. The conclusion is favorable for thoroughly understanding parameters of solute transport model and improving the reliability of the model prediction.

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