

項目	12 月
文獻來源	Jui-Sheng Chen, Yo-Chieh Ho, Ching-Ping Liang, Sheng-Wei Wang, Chen-Wuing Liu, Semi-analytical model for coupled multispecies advective-dispersive transport subject to rate-limited sorption, Journal of Hydrology 579(2019)124164.
英文	<p>Most analytical or semi-analytical models currently used to simulate multispecies transport assume instantaneous equilibrium between the dissolved and sorbed phases of the contaminant. However, research has demonstrated that rate-limited sorption process can have a profound effect upon solute transport in the subsurface environment. This study presents a novel semi-analytical model for simulating the migrations of plumes of degradable contaminants subject to rate-limited sorption. The derived semi-analytical model is then applied to investigate the effects of the rate-limited (nonequilibrium-controlled) sorption on the plume migration of degradable contaminants. Results show that the kinetic sorption rate constant has significant impacts on the plume migration of degradable contaminants. Increasing the kinetic sorption rate constant results in a reduction of predicted concentration for all species in the degradable contaminants while the equilibrium-controlled sorption model lead to significant underestimation of the concentrations of degradable contaminants under conditions with low sorption Damköler number. The equilibrium controlled sorption model agrees well with the rate-limited sorption model when the ratio of Damköler number to the product of distribution coefficient and bulk density is greater than 2 or 3 order of magnitude.</p>
中文	<p>當前大多數使用解析或半解析模式模擬多物種傳輸遷移時，多假設溶解與吸附之間具有瞬時平衡。但是，研究證明速率受限的吸附過程可能對地下環境中的溶質傳輸遷移產生深遠影響。因此，本研究提出一種新型的半解析模式，應用於可降解污染物受到速率限制的吸附作用過程中，模擬其污染物羽流的傳輸遷移。</p>

在推導得出新型的半解析模式後，進一步加以應用研究速率限制吸附（非平衡控制）對可降解污染物羽流遷移傳輸的影響。研究結果顯示，動力吸附速率常數對可降解污染物羽流遷移傳輸具有顯著的影響。

增加動力吸附速率常數，將導致降低水中可降解污染物中所有物種的預測濃度，如此，在平衡控制吸附模式裡因低吸附 Damköler 數條件下，致使對可降解污染物濃度顯著低估。當 Damköler 數與分佈係數和堆積密度的乘積之比大於 2 或 3 個等級(order)時，平衡控制吸附模式與速率限制吸附模式的結果會非常吻合。