Dynamic plant uptake modelling and mass flux estimation

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Abstract Plants significantly influence contaminant transport and fate. Important processes are uptake of soil and groundwater contaminants, as well as biodegradation in plants and their root zones. Models for the prediction of chemical uptake into plants are required for the set-up of mass balances in environmental systems at different scales. Feedback mechanisms between plants and hydrological systems can play an important role. However, they have received little attention to date. Here, a new model concept for dynamic plant uptake models applying analytical matrix solutions is presented, which can be coupled to groundwater transport simulation tools. Exemplary simulations of plant uptake were carried out in order to estimate chemical concentrations in the soil–plant–air system and the influence of plants on contaminant mass fluxes from soil to groundwater.

Key words plant uptake; dynamic; analytical solution; mass fluxes; groundwater transport; coupling