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# Conditional PDFs of concentrations for mixing-controlled reactive transport in heterogeneous aquifers

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Transport of reactive species in the subsurface is driven by mixing processes. Whenever all reactions can be considered in chemical instantaneous equilibrium, a multiespecies reactive transport problem can be fully defined in terms of mixing driven conservative quantities, termed components, and the spatio-temporal distribution of reaction rates. Mixing itself is caused by local dispersion. We investigate the parameters controlling reaction rates and their uncertainty in a randomly stratified heterogeneous aquifer. To achieve this, we provide a mathematical framework to evaluate the probability density function (pdf) of spatio-temporal distributions of concentrations of reactive solutes (and associated reaction rates) evolving in a randomly heterogeneous aquifer. By taking advantage of the procedure of De Simoni et al. [2005, 2007] to deconstruct the reactive transport problem into the analysis of a conservative transport process and the solution of a chemistry-related problem, we ultimately obtain a partial differential equation for the (conditional) pdf of conservative aqueous species, which is derived for a particular case.