



Lagrangian velocity correlation and effective transport models for highly heterogeneous permeability fields

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We investigated the relationship between the velocity distribution and organization and the relevant effective solute transport models for highly heterogeneous lognormal permeability fields. We first characterized numerically the distribution of Lagrangian velocity correlation times and lengths. This allows quantifying potential long range temporal or spatial velocity correlations. We then investigated how to define an equivalent random walk model that reproduces these correlation properties. We showed that the velocity transitions along the particle paths can be represented by a Markov Chain model defined by a constant spatial increment and a probability transition matrix. We thus defined a random walk model that respects the Lagrangian velocity field correlation properties. The resulting model is basically a CTRW model that is upscaled from the velocity statistics. Such an approach appears to be promising for defining effective solute transport models for highly heterogeneous permeability fields.