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What controls apparent field capacity coefficients obtained from convergent flow tracer tests in anisotropic randomly heterogeneous formations?

Daniel Fernandez-Garcia (1), Daniele Pedretti (1), Xavier Sanchez-Vila (1), David Benson (2), and Diogo Bolster (3)

(1) Universidad Politecnica de Catalunya, Enginyeria del Terreny, Barcelona, Spain (daniel.fernandez.g@upc.edu), (2) Colorado School of Mines, Colorado, USA, (3) University of Notre Dame, Indiana, USA

Memory functions and mass transfer models have been widely used to simulate non-Fickian transport in naturally occurring heterogeneous formations. Yet, the link between the heterogeneous structure and the memory function parameters is largely unknown under convergent flow conditions driven by a pumping well. In this work we evaluate the impact of anisotropy in the heterogeneous structure of the hydraulic conductivity on the field capacity coefficient, which is the parameter in the memory function that controls the potency of exchanging mass between areas of relatively low permeability and areas delineating preferential flows. To achieve this, we analyze the apparent field capacity coefficient obtained from the interpretation of extensive Monte Carlo simulations of convergent flow tracer tests performed in randomly heterogeneous hydraulic conductivity fields generated with different anisotropy ratios. Results show that the field capacity coefficient is largely controlled by the anisotropy in the correlation structure of the hydraulic conductivity field and their inherent connectivity patterns.