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Transport under advective trapping

Juan J. Hidalgo¹, Insa Neuweiler², and Marco Dentz¹

¹IDAEA - CSIC, Geosciences, Barcelona, Spain (juan.j.hidalgo@idaea.csic.es)

²Leibniz Universität Hannover

Advective trapping occurs when solutes enter a low velocity zone in the porous medium. Current multirate mass transfer (MRMT) models consider slow advection and diffusion but do not separate these processes, which makes parameterization difficult. Here we investigate the impact of advective trapping on transport in media consisting of isolated low permeability inclusions. Breakthrough curves show that effective transport changes from a streamtube model to genuine MRMT as the degree of disorder of the inclusion arrangement increases. We discuss the mathematical formulation in the MRMT and CTRW frameworks and the impact of the spatial geometry on the ergodicity and stationarity of large scale transport. These findings give new insight into transport in highly heterogeneous media.