Convective mixing in heterogeneous porous media

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We study the relation between convective instabilities and the heterogeneity of the porous medium. We consider a Rayleigh-Bénard instability driven by the density changes created by a sustained temperature difference in a porous medium characterized by a multi-Gaussian permeability field. Heterogeneity alters the shape and persistence of the scalar patterns as it interacts with the velocity field structure. The mixing efficiency of the system is also analysed. We observe that the boundary fluxes are proportional to the variance of the permeability field. However, the system tends to be less well-mixed as the heterogeneity creates preferential flow paths that segregate the system.