Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Solute Blob Evolution and Mixing Dynamics in a Darcy Scale Heterogeneous Porous Medium MARCO DENTZ, IDAEA-CSIC, TANGUY LE BORGNE, University of Rennes, FELIPE DE BARROS, USC — We study the mixing behavior of a dissolved substance that evolves from a solute blob in a two-dimensional heterogeneous porous medium. The study scale is mesoscopic so that flow is governed by Darcy's law. Heterogeneity is induced by spatially variable permeability. The fundamental mechanism governing the evolution and mixing dynamics of a solute blob are the competition of the stretching action of a material line and diffusion. We formulate the transport problem in a Lagrangian framework and consider the motion of solute particles that form the blob, in the coordinate system attached to the material element on which it originates. The blob evolution is fully characterized by the stochastic time series of stretching and shear rates of the material segment in its own coordinate system. Theses stochastic series are investigated numerically using random wak particle tracking simulation. In this stochastic framework, we study the ensemble concentration PDF, concentration entropy and scalar dissipation rate. The aim is to relate the mixing properties to the appearance of coherent structures as quantified by the Okubo-Weiss measure and its Lagrangian counterpart.

Marco Dentz
IDAEA-CSIC

Date submitted: 02 Aug 2013 Electronic form version 1.4