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Mixing-Scale Dependent Dispersion For Transport in Heterogeneous Flows MARCO DENTZ, Spanish National Research Council (IDAEA-CSIC), Barcelona, Spain, FELIPE P.J. DE BARROS, University of Southern California (USC), Los Angeles, CA, USA — Dispersion quantifies the impact of microscale velocity fluctuations on the effective movement of particles and the evolution of scalar distributions in heterogeneous flows. It depends on the interaction between the velocity fluctuation scales and the scale on which the scalar is homogenized. The mixing, or coarse grained scale is the characteristic length below which the scalar is well mixed. It evolves in time as a result of dispersion and deformation of material fluid elements in the heterogeneous flow. We propose to use the mixing scale as a natural coarse graining scale for dispersion in heterogeneous flows. Using a stochastic modeling approach, we derive explicit expressions for the mixing-scale dependent dispersion coefficients and their variance. The fundamental mechanisms of local dispersion and compression of material fluid elements on evolving velocity scales determine the evolution of mixing-scale dependent dispersion and its self-averaging behavior.

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