Dispersion of Passive Tracers in Disordered Porous Media

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ABSTRACT

We here present a comprehensive statistical analysis of Lagrangian trajectories and the pair particles separation in flows inside (realistic) three dimensional porous media obtained in numerical simulations. The tracking of individual trajectories allows us to go beyond the mean square displacement (MSD) and single-point probability densities which are insufficient to fully describe the geometrically induced anomalous behavior of such stochastic processes [1, 2]. We determine the Finite-Size Lyapunov coefficients for the pair particles dispersion. We also discuss the effects of an external field (pressure gradient) on the Lagrangian velocity autocorrelation function and the mean square displacement. We then examine the applicability of continuous time random walks (CTRWs) to model the anomalous fluctuations of the passive tracers in such random environments. From these models an Einstein's fluctuation dissipation relation in the asymptotic regime is derived as observed in several numerical experiments.

References

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2. Michael Schmiedeberg, Vasily Yu Zaburdaev and Holger Stark , *On moments and scaling regimes in anomalous random walks,* **J. Stat. Mech. (2009) P12020.**