Abstract Submitted
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Lagrangian Approach for Hydrodynamic Dispersion in Porous Media[1] VI NGUYEN, DIMITRIOS PAPAVASSILIOU, University of Oklahoma — Realizing that the nature of dispersion in porous media is Lagrangian, we define a Peclet number by a Lagrangian length scale that takes molecular diffusion, advection and medium geometry into consideration. A lattice Boltzmann method is used to simulate the flow in packed beds containing mono-disperse, bi-disperse and tri-disperse spheres with different packing configurations. Then, Lagrangian Particle Tracking is applied to track the trajectories of particles with Schmidt numbers between 100 to 10,000, as they move in the simulated flow fields. The numerical approach has been validated previously [1-3]. These data allow the direct calculation of dispersion coefficients and Lagrangian time (or length) scales. The effective diffusivity is determined based on the dispersion coefficient of particles at a static flow field. It is found that while there is no unique form of equations to relate the dispersion coefficients to the effective diffusivity and the Eulerian Peclet number, a linear dependence on the Lagrangian Peclet number is observed. The slope of the line varies with the medium structural properties and can be predicted a-priori, making as strong case that the Lagrangian approach is not only natural, but also offers an accurate representation of hydrodynamic dispersion in porous media. References: [1] R. Voronov, et al., *J. Biomech.*, 43(7), 1279–1286, 2010. [2] N. H. Pham, et al., *Phys. Rev. E.*, 89(3), 1–13, 2014. [3] R. S. Voronov, et al. *Int. J. Numer. Methods Fluids*, 67(4), 501–517, 2011.

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