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Comparison of turbulent mixing and chaotic advection in a two-dimensional wall-bounded domain BENJAMIN KADOCH, IUSTI-CNRS, Aix-Marseille University, Marseille, France, WOUTER BOS, LMFA-CNRS, Ecole Centrale de Lyon, University of Lyon, Ecully, France, KAI SCHNEIDER, M2P2-CNRS & CMI Aix-Marseille University, Marseille, France — The mixing of a passive scalar blob in a confined vessel is studied. A flow is generated by a rod, describing a figure-eight motion. The two-dimensional incompressible Navier-Stokes and advection-diffusion equations are solved using direct numerical simulation with no-slip and no-flux boundary conditions for the velocity and scalar, respectively. These boundary conditions are imposed on the wall and the rod by using a volume penalization method as described in in Ref. [1], in combination with a classical Fourier pseudo-spectral code. The decay of scalar variance in Stokes regime, for different Schmidt numbers, is compared with the one obtained in Ref. [2] for chaotic mixing. Subsequently, the influence of Reynolds and Schmidt numbers on turbulent mixing is investigated. In order to quantify the mixing at infinite Schmidt number, we measure the dispersion of tracer particles. Both the variance and higher moment statistics for the scalar concentration are analyzed. We show that the scalar variance decays in time following a powerlaw.

[1] B. Kadoch, D. Kolomenskiy, K. Schneider and P. Angot. J. Comput. Phys., 231, 4365-4383, 2012.
[2] E. Gouillart, O. Dauchot, B. Dubrulle, S S. Roux, and J.-L. Thiffeault. Phys. Rev. E 78, 026211, 2008.

Kai Schneider
M2P2-CNRS & CMI Aix-Marseille University, Marseille, France

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