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Chaotic advection of immiscible fluids[1] BENJAMIN VOLLMAYR-LEE, Bucknell University, DANIEL BELLER, University of Pennsylvania, SOHEI YASUDA, Purdue University — We consider a system of two immiscible fluids advected by a chaotic flow field. A nonequilibrium steady state arises from the competition between the coarsening of the immiscible fluids and the domain bursting caused by the chaotic flow. It has been established that the average domain size in this steady state scales as a inverse power of the Lyapunov exponent. We examine the issue of local structure and look for correlations between the local domain size and the finite-time Lyapunov exponent (FTLE) field. For a variety of chaotic flows, we consistently find the domains to be smallest in regions where the FTLE field is maximal. This raises the possibility of making universal predictions of steady-state characteristics based on Lyapunov analysis of the flow field.

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