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The effect of finite Reynolds numbers on chaotic advection
PRADEEP RAO, ANDREW DUGGLEBY, Texas A&M University, PANKAJ KUMAR, MARK STREMLER, Virginia Tech — The effect of finite Reynolds numbers on chaotic advection is investigated for two dimensional lid-driven cavity flows that exhibit topological chaos in the creeping flow regime. The exponential convergence afforded by the use of spectral methods enables accurate tracking of passive scalars and exponential stretching of material lines in the flow. The emphasis in this endeavor is to study how the inertial effects present due to the low, but non-zero, Reynolds numbers produce irreversibilities in the system that affect the efficacy of mixing. Comparisons are made with Stokes flow results for the same configurations. The application of these results to systems that can effectively separate two substances with slightly different diffusivities in a medium are discussed.

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