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Mixing characteristics of laminar two-dimensional co-rotating vortex merging[1] PAULO FERREIRA DE SOUSA, Mechanical Engineering Department, New Mexico State University — The mixing characteristics of laminar, two-dimensional, co-rotating vortex merging were studied. The unsteady, incompressible two-dimensional Navier–Stokes equations were solved with fourth-order Runge–Kutta temporal discretization and fourth-order compact schemes for spatial discretization. Previous experimental research has uncovered four meaningful physical stages in the merging of co-rotating vortices. In this study, passive Lagrangian tracers were used to explore the transport of fluid elements during these stages and to provide a detailed view of the merge. The dynamics of Lagrangian tracers improved the characterization of the core dynamics and identified the fluid entrainment regions in the final vortex core. Chaotic advection was studied in the merging process by examining patterns of spatial variation in finite-time Lyapunov exponents. These patterns characterized the chaotic mixing regions and pinpointed transport barriers throughout the evolution.

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