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Simulations of temporal evolution of isolated trailing vortices KARTHIKEYAN DURAISAMY, SANJIVA LELE, Center for Turbulence Research, Stanford University — The temporal evolution of turbulent trailing vortices is studied using pseudo-spectral direct numerical simulations of the vorticity transport equations. A range of initial conditions are used, covering a wide spectrum of swirl numbers, different base flow profiles and varied perturbations. In the inviscidly-unstable swirl number range, the flow is characterized by the dynamics of saturating helical instabilities, as has been observed previously. In the low swirl number range, the evolution is dominated by structures in the outer part of the vortical core, resulting in enhanced angular momentum transport and a significant circulation overshoot. Though markedly different from the high swirl number cases in the transient regime, low swirl number Batchelor vortices ultimately reach an equilibrium self-similar state. The long time evolution of each of these cases is investigated. The mechanisms of turbulent production and angular momentum transport are detailed.

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