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**Mechanics of Viscous Vortex Reconnection** F. HUSSAIN, U. of Houston, K. DURAISAMY, Stanford U. — This work builds on our long-standing claim that reconnection of coherent structures is the dominant mechanism of jet noise generation and that reconnection plays a key role in both energy cascade and fine-scale mixing in fluid turbulence. Reconnection of two anti-parallel vortex tubes is studied by direct numerical simulations of the incompressible Navier-Stokes equations over a wide range (250-9000) of the vortex Reynolds number (Re). Reconnection is never complete, leaving behind a part of the initial tubes as "threads," which then undergo successive reconnections (our cascade and mixing scenarios) as the newly formed "bridges" recoil from each other by self-advection. We find that the time $t_R$ for orthogonal transfer of circulation scales as $t_R \approx Re^{-3/4}$. The shortest distance $d$ between the tube centroids scales as $d \approx a(Re(t_o - t))^{3/4}$ before reconnection and as $d \approx b(Re(t - t_o))^2$ after reconnection. Bridge repulsion is faster than collision and has less variation as local induction predominates, and is clearly the most intense sound generation phase. The maximum rate of vortex circulation transfer, enstrophy production and dissipation scale as $Re^1, Re^{7/4}, Re^{-1/2}$, respectively.

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