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Numerical Investigations of Reconnection of Quantized Vortices CECILIA RORAI, University of Maryland-Università di Trieste, MICHAEL E. FISHER, DANIEL P. LATHROP, University of Maryland, KATEPALLI R. SREENIVASAN, New York University, ROBERT M. KERR, University of Warwick — Reconnection of quantized vortices in superfluid helium was conjectured by Feynman in 1955, and first observed experimentally by Bewley et al. (PNAS 105, 13708, 2007). The nature of this phenomenon is quantum mechanical, involving atomically thin vortex cores. At the same time, this phenomenon influences the large scale dynamics, since a tangle of vortices can change topology through reconnection and evolve in time. Numerically, the Gross-Pitaevskii (GP) equation allows detailed predictions of vortex reconnection as first shown by Koplik and Levine (1993). We have undertaken further calculations to characterize the dynamics of isolated reconnection events. Initial conditions have been analyzed carefully, different geometries have been considered and a new approach has been proposed. This approach consists in using the diffusion equation associated to the GP equation to set minimum energy initial vortex profiles. The underlying questions we wish to answer are the universality of vortex reconnection and its effect on energy dissipation to the phonon field.

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