Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Characterization of the interaction of two unequal co-rotating vortices KEIKO NOMURA, LAURA BRANDT, University of California, San Diego — The interaction of two co-rotating vortices in a viscous fluid is investigated. Two-dimensional simulations of initially equal sized vortices with varying relative strengths are performed. In the case of equal strength vortices (Brandt and Nomura, J. Fluid Mech., 2007), the mutually induced strain deforms and tilts the vortices which leads to a core erosion process. As the vortices are jointly entrained, they rapidly move towards each other and the flow eventually transforms into a single vortex. With unequal strengths, the disparity of the vortices alters the interaction and merger may not occur. The flow behavior is distinguished based on the relative onset of the core erosion process. Through scaling analysis and simulation results, a critical nondimensional strain rate characterizing the onset of erosion is determined. If the disparity of strengths is sufficiently large, the critical strain rate is not attained by the stronger vortex and the vortices do not merge.

Keiko Nomura
University of California, San Diego