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Viscous interactions of asymmetric co-rotating vortex pairs LAURA BRANDT, TOMASZ CICHOCKI, KEIKO NOMURA, University of California, San Diego — The physics underlying the interaction of a co-rotating vortex pair of equal size and different strengths in a viscous fluid is investigated. High resolution two-dimensional direct numerical simulations (DNS) are performed using a pseudospectral computational fluid dynamics code. The evolution of the vortices by diffusion and deformation are examined in the co-rotating frame. In the case of equal strength (symmetric) vortices, the vortices will merge through mutual core erosion and entrainment. The point at which the cores are entrained is marked by a critical aspect ratio (the vortex core radii over the separation distance). However, in the case of vortex pairs of different strengths (asymmetric), merger does not occur according to the criterion set by symmetric merger. The erosion and entrainment process is no longer mutual and a new merging criterion is developed based on the relative location of the central hyperbolic point with respect to each vortex. Depending on the relative strength of the two vortices, three flow regimes are possible: complete merger, partial merger and partial straining out.

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