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A Quantitative Assessment of Asymmetric Vortex Interactions in Viscous Flow PATRICK FOLZ, KEIKO NOMURA, University of California, San Diego — The interactions of two co-rotating vortices in viscous fluid are investigated using 2D numerical simulations, performed across a range of vortex strength ratios, $\Lambda = \Gamma_1/\Gamma_2$, with differing initial size and/or peak vorticity. In all cases, the interaction produces a single vortex which is quantitatively evaluated, in particular in terms of an enhancement factor, $\varepsilon = \Gamma_{final}/\Gamma_{initial}$, akin to what has previously been done for inviscid flow. The analysis monitors the vortex cores throughout the interaction and identifies the end of the interaction, at which time the existing vortex is assessed. Symmetric pairs produce a compound vortex with ε near the maximum value of 2. For asymmetric pairs, ε and the associated merging efficiency generally decrease with Λ, although differing pairs with the same Λ may produce different outcomes. For significantly disparate vortices, one of the original vortices survives without enhancement, i.e., $\varepsilon \sim 1$. These observations are explained in terms of underlying physics. Comparisons are made with available experimental data.

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