

Abstract Submitted  
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**Annihilation of strained vortices** YOSHIFUMI KIMURA, Nagoya University — As an initial stage of vortex reconnection, approach of nearly anti-parallel vortices has often been observed experimentally and studied numerically. Inspired by the recent experiment by Kleckner and Irvine on the dynamics of knotted vortices [1], we have studied the motion of two anti-parallel Burgers vortices driven by an axisymmetric linear straining field. We first extend the Burgers vortex solution which is a steady exact solution of the Navier-Stokes equation to a time-dependent exact solution. Then by superposing two such solutions, we investigate the annihilation process analytically. We can demonstrate that during the annihilation process the total vorticity decays exponentially on a time-scale proportional to the inverse of the rate of strain, even as the kinematic viscosity tends to 0. The analytic results are compared with the numerical simulations of two strained vortices with the vortex-vortex nonlinear interaction by Buntine and Pullin [2].

[1] Kleckner, D. & Irvine, W.T.M. 2013 Creation and dynamics of knotted vortices. *Nature Physics* **9**, 253258. doi: 10.1038/nphys2560.

[2] Buntine, J.D. & Pullin, D.I. 1989 Merger and cancellation of strained vortices. *J. Fluid Mech.* **205**, 263-295.

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