

Punctuated energy injection in superfluid helium-4 vortex reconnections

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An article usually includes an abstract, a concise summary of the work covered at length in the main body of the article.

INTRODUCTION

METHOD

MAIN RESULTS

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- [1] A. Villois, D. Proment, and G. Krstulovic, Irreversible Dynamics of Vortex Reconnections in Quantum Fluids, Phys. Rev. Lett. **125**, 164501 (2020).

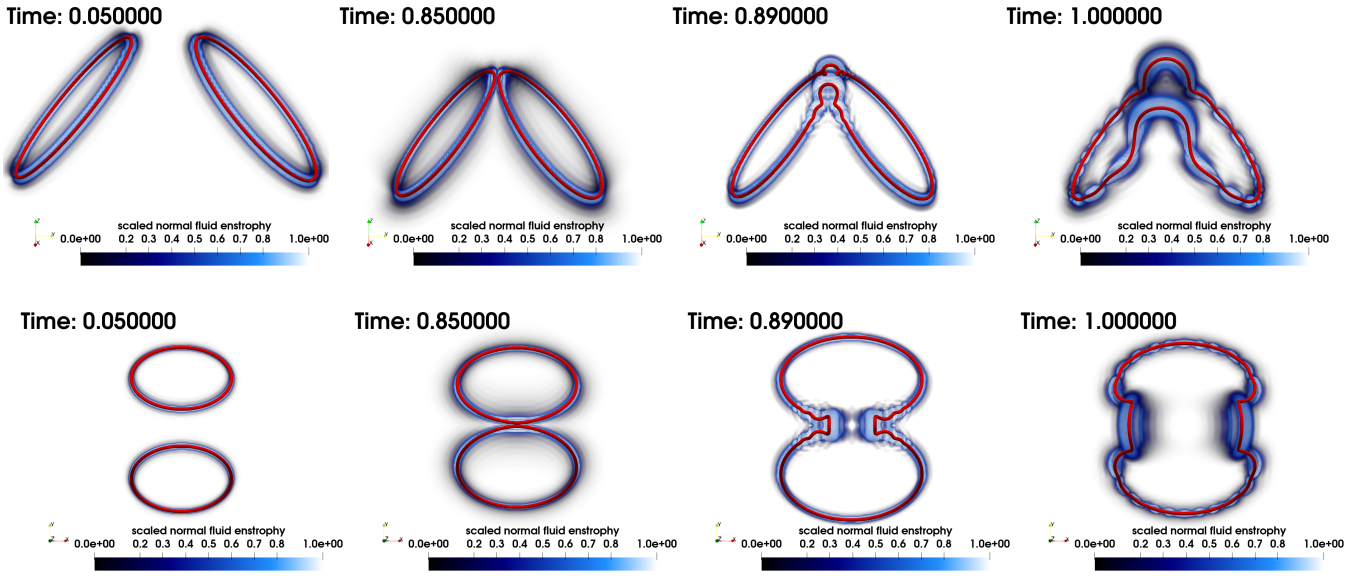


FIG. 1: 3D rendering of vortex ring collisions, from a tent-like initial condition. The red tube represents a superfluid vortex, where the radius has been greatly exaggerated for visual purposes, and the blue volume rendering represents the scaled normal fluid enstrophy ω^2/ω_{max}^2 . *Top row*: Isometric view. *Bottom row*: View of the xy -plane.

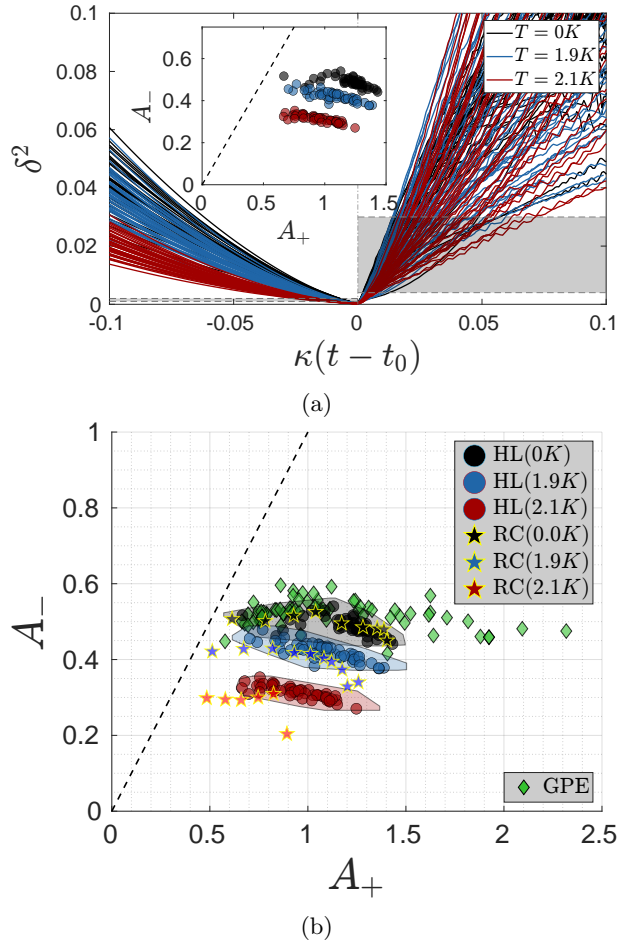


FIG. 2: (a): Time evolution of the minimum distance squared δ^2 for the Hopf link initial conditions at $T = 0K, 1.9K$ and $2.1K$. The grey shaded area represents the vertical region used to estimate the prefactors A^\pm . *Inset*: Values of the separation prefactor A^+ and approach prefactors A^- . (b): Comparison of all prefactor values, *HL*-Hopf link (circles), *RC*-ring collision (stars with yellow outline), GPE-data from Gross-Pitaevskii simulations from Villois *et al.* [1]. The shaded areas associated with each colour represent the convex hull of errors for each temperature.

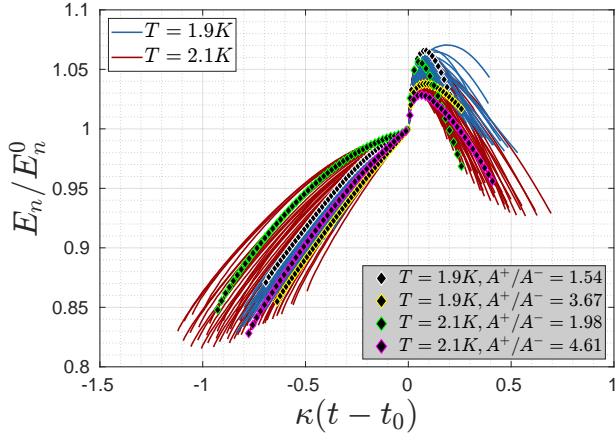


FIG. 3: Total normal fluid kinetic energy E_n scaled by the kinetic energy at reconnection time E_n^0 . Black diamonds represent the simulations with minimum and maximum prefactor ratios A^+/A^- at $T = 1.9K$ and $T = 2.1K$ respectively.

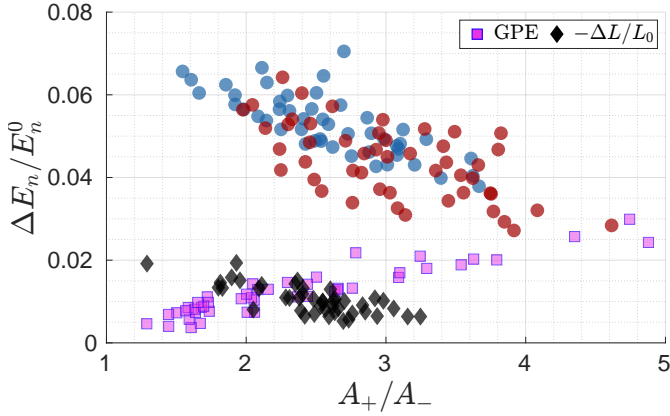


FIG. 4: The total energy jump $\Delta E_n = E_n^0 - E_n(t_{max})$, where t_{max} is such that $E_n(t_{max}) = \max(E_n(t > t_0))$. The solid black diamond represents the change in line length ΔL in the $T = 0K$ case, and the purple squares is from GP simulations from Villosi *et al.* [1]