

Abstract Submitted
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Analysis of vortex reconnection sound via decomposition of Lighthill's source term¹ HAMID DARYAN, University of Waterloo, FAZLE HUSSAIN, Texas Tech University, JEAN-PIERRE HICKEY, University of Waterloo — Vortex reconnection is a dominant source of sound produced in vortical flows (Daryan *et. al.*, Phys. Rev. Fluids, 5, 062702(R) (2020)). We study the noise generation mechanisms in the reconnection of two antiparallel vortices at the vortex Reynolds number of 1500 via high-order direct numerical simulations of the compressible Navier-Stokes equation. A decomposition of the Lighthill's source term is provided; the evolution of each term is investigated for three subsonic Mach numbers of 0.3, 0.5, and 0.7. More specifically, the role of the tilting of the vorticity vector and deviation from the isentropic condition in sound generation is explored. Finally, scaling relations based on Mach number are considered for the dominant source terms and far-field sound. The current study provides a detailed analysis of the sound generation mechanism in a three-dimensional canonical viscous flow.

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