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Characterizing Mixing in a Quasi-Two-Dimensional Flow using Persistent Homology JEFFREY TITHOF, DOUGLAS KELLEY, University of Rochester — Fluid mixing is a tremendously important phenomenon present in numerous physical systems, both natural and human-made. Describing, understanding, and predicting the mixing behavior of fluid flows poses an immense challenge. In this work, we explore the utility of topological data analysis in quantifying fluid mixing. We analyze Eulerian and Lagrangian quantities obtained from a quasi-two-dimensional flow realized by driving a thin layer of fluid with electromagnetic forces. Our analysis employs persistent homology, which offers a unique framework for quantifying topological features associated with connectivity in the fluid flow. Preliminary results suggest that this topological approach offers new physical insight, complementing existing methods for quantifying fluid mixing.

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