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Topological chaos in flows on surfaces of arbitrary genus
MATTHEW FINN, University of Adelaide, JEAN-LUC THIFFEAULT, University of Wisconsin — The emerging field of topological fluid kinematics is concerned with design and analysis of effective fluid mixers based on the topology of the motion of stirring apparatus and other periodic flow structures. Knowing even a small amount of flow topology often permits very powerful diagnoses, such as proving existence of chaotic dynamics and a lower bound on mixing measures based on material stretching. In this paper we present a canonical method for examining flows on surfaces of arbitrary genus given the flow topology encoded as a braid. The method may be used to study fluid mixing driven by an arbitrary number of stirrers in either bounded or spatially periodic fluid domains. Additionally, and unlike previous techniques, the current work may also be applied to flows on manifolds of higher genus.

Matthew Finn
University of Adelaide

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