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Topological fluid mechanics of stirring in a non-Newtonian fluid XUEMEI CHEN, ANTHONY NELSON, MATTHEW BOKULIC, KELLEN SHAIN, MARK STREMLER, Virginia Tech — It is well known that laminar flows, both Newtonian and non-Newtonian, can be stirred effectively using chaotic advection, which produces exponential stretching and folding of material lines and surfaces. A recent development in this field is the concept of topological choas, in which the topology of the trajectories of moving rods can be used to predict a lower bound on the stretching of the surrounding fluid. We present the first analysis of topological chaos in a non-Newtonian fluid using experimental and computational tools. The power of this approach lies in the fact that a lower bound on the stretching is established independent of the fluid properties, making it possible to predict efficient stirring even when the fluid properties are quite complex and/or not well characterized.

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