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Peristalsis of a viscoelastic fluid in a cavity with closed ends
SARAH LUKENS, University of Pittsburgh, JOHN CHRISPELL, LISA FAUCI, Tulane University — Theoretical studies in microfluidics have examined a "peristaltic mixer" - one that consists of a fluid filled cavity bounded above and below by flexible membranes which vibrate mechanically in a prescribed fashion. We use Lagrangian coherent structure (LCS) methods to identify geometric flow regions in a finite channel with closed ends due to low amplitude, high frequency peristaltically driven walls. The presence of sidewalls introduces a return flow in the system. We observe consistency with the asymptotic solutions in the Newtonian case. Cellular flow patterns are observed for Newtonian and Oldroyd-B fluids, and striking differences emerge when viscoelasticity is introduced.

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