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**Large-Amplitude Peristaltic Pumping of a Viscoelastic Fluid** JOSEPH TERAN, Courant Institute, New York University, LISA FAUCI, Dept. of Mathematics, Tulane University, MICHAEL SHELLEY, Courant Institute, New York University — Peristaltic pumping by wave-like musculuar contractions is a fundamental biomechanical mechanism for fluid and material transport, and is used in the esophagus, intestine, oviduct and ureter. While peristaltic pumping of a Newtonian fluid is well understood, in many important applications (as in the fluid dynamics of reproduction) the fluids have non-Newtonian responses. Recent work has focused on large wave-length peristalsis of Oldroyd fluids. To study the problem more generally, we have developed a numerical method for simulating an Oldroyd-B fluid coupled to a deforming elastic membrane. A MAC grid-based projection method is used for the fluid equations and an immersed boundary method is used for coupling to a Lagrangian elastic representation of the deforming walls. We examine numerically the peristaltic transport of a viscous Oldroyd-B fluid over a range of Weissenberg numbers and peristalsis wave-lengths, and demonstrate fundamentally different and important behavior in the presence of large amplitude, short-wavelength peristalsis. We also demonstrate the loss of flow reversibility, and its consequences, due to fluid visco-elasticity.

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