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Flow instability and mixing of a complex fluid with extensional microstructure MEREDITH BETTERTON, Department of Physics, University of Colorado, ANG-SHENG HANG, MICHAEL SHELLEY, Courant Institute, NYU — Several complex fluid systems show extensional dynamics in their microstructural evolution. Examples include isotropic-to-smectic liquid crystal phase transitions, and the relative sliding dynamics of microtubules induced by motor protein activity. To understand the macroscopic dynamics of such a system, we examine a simple kinetic model of a suspension of extending, hydrodynamically-coupled fibers. It is similar in structure to recent theories of motile suspensions. Our stability analysis shows the existence of large-scale flow instabilities, and numerical simulation of the nonlinear kinetic-fluid model shows the development of strongly time-dependent and complex macroscopic flows.

Michael Shelley
Courant Institute of Mathematical Sciences, NYU

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