Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Low-order modelling of non-axisymmetric flow on the exterior of a fibre[1] JAMES REILLY, ALEXANDER WRAY, STEPHEN WILSON, Strathclyde University , OMAR MATAR, Imperial College London — Flows on the outside of fibres have received extensive attention over the years. Even in the Stokes limit they exhibit interesting behaviour due to dual role of capillarity, exhibiting simultaneously both a destabilising "hoop stress" in the azimuthal direction as well as a more conventional stabilising effect in the axial direction. In this limit, the flow is always axisymmetric. However, for sufficiently thick films and with a sufficiently high Reynolds number, non-axisymmetric instabilities are observed. While this has been predicted using linear stability theory and confirmed using direct numerical simulations and experimentation, it has proven problematic to model. Existing models have either required that films be both thin and close to threshold (Shlang and Sivashinsky, 1982) or that the flow be axisymmetric (Ruyer-Quil *et al.*, 2008). Using the methodology of Wray *et al.*, 2017, we develop a fully nonlinear model for thick flow down the outside of a fibre at moderate levels of inertia. We compare its predictions against those from numerical computations in both the linear and nonlinear regimes to assess its validity, before using it to elucidate the complex interplay of viscosity, capillary, inertia, and gravity that gives rise to the observed flow patterns.

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Date submitted: 29 Jul 2019 Electronic form version 1.4