DYNAMICS, STABILITY AND BREAK UP OF NON-NEWTONIAN SLENDER DROPS IN EXTENSIONAL FLOW: INERTIA EFFECTS

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We have studied the effect of inertia on the steady and unsteady deformation patterns of non Newtonian (shear thinning) slender drops embedded in an extensional flow of a viscous Newtonian fluid. The analysis, which follows Acrivos and Lo [1] and Favelukis et al. [2], reveals the following characteristics:

- The multiple steady solutions for the deformation patterns, that exist under creeping flow, further bifurcate under the action of inertia.
- A stability analysis identifies stable stationary shapes from unstable ones.
- A possible hysteresis in the deformation curve is shown in a limited region of the parameters phase space.
- The stability analysis suggests the existence of more than one break up mechanism for the slender drops, depending on the relative intensity of inertia.
- The dynamic study of unstable drops reveals, at least, two different disintegration mechanisms: center pinching and indefinite elongation.

References:

[1] Acrivos, A. & Lo, T.S., "Deformation and breakup of a single slender drop in an extensional flow," *J. Fluid. Mech.* **86**, 641-672, 1978.
[2] Favelukis, M., Lavrenteva, O.M. & Nir, A., "Deformation and breakup of a non-Newtonian slender drop in an extensional flow," *J. Non-New. Fluid Mech.*. **125**, 49-59, 2005.

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