Abstract Submitted
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**Insights on the local dynamics during transient flows of waxy crude oils**[1] MICHELA GERI, Hatsopoulos Microfluids Laboratory - MIT, BRICE SAINT-MICHEL, Laboratoire de Physique, ENS de Lyon UMR 5672 - Université de Lyon, THIBAUT DIVOUX, CRPP, CNRS UPR8641 - Université de Bordeaux, SEBASTIEN MANNEVILLE, Laboratoire de Physique, ENS de Lyon UMR 5672 - Université de Lyon, GARETH H. MCKINLEY, Hatsopoulos Microfluids Laboratory - MIT — Waxy crude oils are mixtures of hydrocarbons and paraffin wax that behave as a Newtonian liquid at high temperatures and display solid-like properties below the solidification temperature of wax. In the latter case, waxy crude oils exhibit a yield stress and show a pronounced time-dependent behavior. By means of rheometry coupled to time-resolved ultrasonic velocimetry we investigate the local scenario associated with a series of decreasing and increasing ramps of shear rate composed of successive steps during which the stress is left to equilibrate for a fixed time. While being fully fluidized or 'shear-melted' at large shear rates, we observe that the sample experiences wall slip despite using rough boundary conditions and an arrested band grows inwards towards the rotor as the shear rate is decreased. This shear banding scenario arises from an underlying non-monotonic time-dependent response in the shear stress. As the shear rate is ramped back up to its initial value, the sample experiences a delayed yielding transition involving shear banding and wall slip over a range of shear rates that differs from the range observed on the decreasing branch. We finally discuss these results in the framework of a thixotropic elasto-visco-plastic model.

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