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How does a pressure-driven foam jam in a straight channel? SHUBHA TEWARI, University of Massachusetts, Amherst and TIFR Centre for Interdisciplinary Sciences, Hyderabad, KARTHIK MENON, RAMA GOVINDARAJAN, TIFR Centre for Interdisciplinary Sciences, Hyderabad — A Newtonian fluid and a foam flow differently. We highlight this contrast in the pressure-driven flow of a foam through a straight channel. Unlike a Newtonian fluid, a foam in a straight channel does not flow below a threshold driving force. Just above this yield threshold, the flow is intermittent (stick-slip), and crosses over to smooth flow as the driving force is increased. We report on a numerical investigation of these different regimes using a modified version of Durian's bubble model with an added short-ranged attraction potential to account for the effects of disjoining pressures. The crossover from one regime to the other is characterized by an evolution of the flow velocity profile from plug-like to one where the shear layer is much broader. The mean rate of neighbour changes per bubble increases as flow moves towards the steady regime with a distribution that broadens with the strength of the driving. We show that the stick-slip and steady flow regimes can be distinguished by the spectrum of energy fluctuations during the flow. We also vary the strength of the attractive potential and highlight the effect this has on the different regimes.

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