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Particle-laden thin film flows on an incline: experiments and equilibrium theory JACOB BOURICIUS, Mathematics, Harvey Mudd College, TRYSTAN KOCH, Physics, Harvey Mudd College, PAUL LATTERMAN, Bioengineering, UCLA, BRIAN LE, Physics, UCLA, SAMANTHA MESURO, Mathematics, Harvey Mudd College, NEBOJSA MURISIC, ANDREA BERTOZZI, Mathematics, UCLA — We focus on particle-laden thin film flows on an incline. Experiments are carried out where inclination angle, bulk particle volume fraction, liquid viscosity, and particle size are varied. We classify experimental runs based on observed settling regime: settled, where particle settle out of the flow and fingering instability develops at the front (low angles and concentrations); ridged (high angles and concentrations); and well-mixed (intermediate values). We also uncover the transient nature of the well-mixed regime. In addition, in our experiments, the suspension and particulate front motion is tracked using a camera/laser set-up. Using image processing, we are able to extract the instantaneous thin film profiles and record the front motion for all observed flow regimes. The theoretical model we consider is based on equilibrium theory and it balances hindered settling of particles due to gravity against shear-induced migration. Finally, the predictions of this model are shown to be in excellent agreement with our experimental data for settling.

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