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Measurement of steady and transient liquid coiling with high-speed video and digital image processing FRANK AUSTIN MIER, RAJ BHAKTA, NICOLAS CASTANO, JOSHUA THACKRAH, TYLER MARQUIS, JOHN GARCIA, MICHAEL HARGATHER, New Mexico Tech — Liquid coiling occurs as a gravitationally-accelerated viscous fluid flows into a stagnant reservoir causing a localized accumulation of settling material, commonly designated as stack. This flow is broadly characterized by a vertical rope of liquid, the tail, flowing into the stack in a coiled motion with frequency defined parametrically within four different flow regimes. These regimes are defined as viscous, gravitational, inertial-gravitational, and inertial. Relations include parameters such as flow rate, drop height, rope radius, gravitational acceleration, and kinematic viscosity. While previous work on the subject includes high speed imaging, only basic and often averaged measurements have been taken by visual inspection of images. Through the implementation of additional image processing routines in MATLAB, time resolved measurements are taken on coiling frequency, tail diameter, stack diameter and height. Synchronization between a high speed camera and stepper motor driven syringe pump provides accurate correlation with flow rate. Additionally, continuous measurement of unsteady transition between flow regimes is visualized and quantified. This capability allows a deeper experimental understanding of processes involved in the liquid coiling phenomenon.

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