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On the motion of an annular viscous jet LINDA SMOLKA, Bucknell University, JUSTIN NORTH, Ohio State University, BREE GUERRA, The University of Texas at Austin — We experimentally examine the motion of an annular jet of viscous fluid flowing down the outside of a thin, vertical fiber. As other authors have observed, perturbations develop along the free surface of the jet; our focus is on the instability that leads to the formation of these perturbations. We observe a striking transition in the perturbation dynamics at a critical flow rate, Q_c. Above Q_c, the distance from the orifice that perturbations form oscillates in time, and the spacing between perturbations varies, typically leading to the coalescence of neighboring perturbations. For fixed Q below Q_c, the distance from the orifice that perturbations form is constant, and the spacing between consecutive perturbations remains fixed as they travel down the length of the fiber (2 meters). We find the growth of the perturbations is initially rapid followed by a slower phase as they saturate in size. We compare the nascent perturbation growth to theoretical predictions developed from a long-wave model (Craster & Matar, J. Fluid Mech. 553, 85-105 (2006)).

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