Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

A general mechanism for the meandering of rivulets NADINE VALADE, ADRIAN DAERR, Laboratoire Matiere et Systemes Complexes (MSC), UMR 7057 of CNRS and Paris Diderot University, Paris, France, JENS EGGERS, School of Mathematics, University of Bristol, Bristol BS8 1TW, United Kingdom, LAURENT LIMAT, Laboratoire Matiere et Systemes Complexes (MSC), UMR 7057 of CNRS and Paris Diderot University, Paris, France — A rivulet flowing down an inclined or vertical plane often does not follow a straight path, but starts to meander. We show that this instability can appear from two key ingredients: fluid inertia and anisotropy of the friction between rivulet and substrate. Meandering occurs if the fluid motion normal to the instantaneous flow direction is more difficult than parallel to it. This slows down the downstream motion of a meander with respect to that of the fluid, and centrifugal effects can develope in the curved part of the stream. We give a quantitative criterion for the onset of meandering, and confirm it by comparing to the flow of a rivulet between to glass plates which are wetted completely. Above the threshold, the rivulet follows a irregular pattern with a typical wavelength of a few centimeters. This very general mechanism should hold in very different situations (inclined or vertical plates, total or partial wetting, pure fluid or surfactants...) provided that pinning effects of contact lines are not too strong.

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Date submitted: 06 Aug 2010 Electronic form version 1.4