Partial wetting meandering

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Rivers are subject to a meandering instability caused by sediment transport. A liquid rivulet on an incline in partial wetting conditions exhibits a similar instability at sufficiently high flow rates. It takes a sinous shape: curves become bigger and bigger by inertia, growing from contact line defects. Meanders are eventually stationnary because of the pinning force.

The way the initial rivulet is created has consequences on the contact line's shape. We run experiments to study how the critical flow rate depends on initial conditions. We measure a strong dependence, in particular by modifying the initial state from which meanders are growing: it shows that the pinning force plays a main role in the meandering instability. This is in contrast with previous approach in which only a balance is considered between inertia and a line tension of capillary origin.

Because of wetting hysteresis, rivulets have the capacity to deform without any movement of the contact line. These deviations from the symmetrical profile are studied in meandering rivulets where contact lines are fixed. We show that the rivulet deforms in response to the centrifugal force. This deformation also helps us to understand how the critical flow rate depends on the initial rivulet shape.