



Laminar laboratory rivers

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A viscous fluid flowing over fine plastic grains spontaneously channelizes into a few centimeters-wide river. After reaching its equilibrium shape, this stable laboratory flume is able to carry a steady load of sediments, like many alluvial rivers.

When the sediment discharge vanishes, the river size, shape and slope fit the threshold theory proposed by Glover and Florey (1951), which assumes that the Shields parameter is critical on the channel bed.

As the sediment discharge is increased, the river widens and flattens. Surprisingly, the aspect ratio of its cross section depends on the sediment discharge only, regardless of the water discharge.

We propose a theoretical interpretation of these findings based on the balance between gravity, which pulls particles towards the center of the channel, and the diffusion of bedload particles, which pushes them away from areas of intense bedload.