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Stability analysis of laminar flume flow coupled with sediment transport OLIVIER DEVAUCHELLE, CHRISTOPHE JOSSERAND, STEPHANE ZALESKI, Universite de Paris 6 — The ubiquitous formation of regular sedimentary patterns in rivers, such as bars, braids and meanders, is of prime interest to the geomorphologist. Fluid dynamics can provide critical insight into these phenomena. Numerous theoretical advances and laboratory experiments indicate that these patterns do not simply reflect a flow instability or a coherent turbulent structure. Instead, their formation results from the interaction between a surface flow and an erodible substrate, through an erosion law. Indeed, the interface separating the sediment layer from water is found to be unstable in many cases. In particular, small laboratory flumes are able to generate regular sediment patterns, at Reynolds number of the order of, or below 100. This suggests a new approach to the problem: if turbulence is not essential to explain the formation of bars, braids and meanders, then laminar flumes become simple models of their natural turbulent counterparts. Our study presents the theoretical stability analysis of a laminar flume flowing over a sand substrate.

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