

Abstract Submitted
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Model of fluid flow and internal erosion of a porous fragile medium¹ ARSHAD KUDROLLI, XAVIER CLOTET, Clark Univ — We discuss the internal erosion and transport of particles leading to heterogeneity and channelization of a porous granular bed driven by fluid flow by introducing a model experimental system which enables direct visualization of the evolution of porosity from the single particle up to the system scale [1]. Further, we develop a hybrid hydrodynamic-statistical model to understand the main ingredients needed to simulate our observations. A uniqueness of our study is the close coupling of the experiments and simulations with control parameters used in the simulations derived from the experiments. Understanding this system is of fundamental importance to a number of geophysical processes, and in the extraction of hydrocarbons in the subsurface including the deposition of proppants used in hydraulic fracturing. We provide clear evidence for the importance of curvature of the interface between high and low porosity regions in determining the flux rate needed for erosion and the spatial locations where channels grow. [1]: Evolution of Porosity and Channelization of an Erosive Medium Driven by Fluid Flow, Arshad Kudrolli and Xavier Clotet, Phys. Rev. Lett. 117, 028001 (2016).

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