Abstract Submitted
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Armoring, stability, and transport driven by fluid flow over a granular bed[1] BENJAMIN ALLEN, ARSHAD KUDROLLI, Department of Physics, Clark University — We discuss experiments investigating the evolution of a granular bed by a fluid flow as a function of shear rate at the fluid-bed interface. This is a model system to investigate a variety of physical examples including wind blowing over sand, sediment transport in rivers, tidal flows interacting with beaches, flows in slurry pipelines, and sand proppants in hydraulic fracturing. In order to examine the onset and entrainment of the granular bed under steady state conditions, we have constructed a novel conical rheometer system which allows a variable amount of shear to be applied to the granular bed. The grain-fluid system is index matched so that we can visualize the grains away from the sides as well as visualize the fluid flow above and below the interface by using fluorescent tracer particles. We demonstrate that the onset of erosion arises as particles rotate out of their stable position highlighting the importance of torque balance to onset. We find significant armoring of the bed, as the bed is sheared by the fluid flow. Above onset, at least three distinct regions of bed mobility can be found. We will discuss the measured integrated granular flux as a function of shear rate and compare them with empirical laws found in the geophysical literature.

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Arshad Kudrolli
Department of Physics, Clark University

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