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Technology, 2008

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Experimental Study of Tracer Particles

Particles tend to self-sort by size and other particle properties. Understanding this process in gravelbed rivers has implications for stream restoration. In particular, a normal streambed has an armored layer, where large particles form a stable surface on top of a base of relatively smaller particles. Additionally, patches of relatively uniform particles form spontaneously, which ultimately serve as nest for salmon to lay their eggs. These natural stream segregation patterns can be destroyed when subjected to river engineering. Effective and long-term stream restoration requires an understanding of how the particle movements along a riverbed depend on the particle properties.

The focus of this research is to study how particles behave in bedload transport conditions. Typically, particles move in a series of stochastic processes – entrainment of individual particles, movement of those particles down the bed in a series of hops, and disentrainment, sometimes followed by burial. The size dependence of these processes is not understood, but the statistics and details of each stage of the movements is likely dependent both on the size of the particle in question and the particle size distribution of the particles surrounding the particle at each particular phase. I have been using a small gravel-bed laboratory flume to systematically study the size dependence of these stochastic processes and using a simple model written for Matlab to compliment the experimental results. In my presentation, I will present results from preliminary experimental and computational studies and plans for future work.



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