

2D MOTION OF A SINGLE BEAD DOWN A WATER FLOW IN A STEEP CHANNEL

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In steep channels, for shallow water flow, bed-load transport depends not only on the water flow but also on particle interactions. The particle interactions have significant effects and thus should be taken into account. Here we are concerned with the interaction between a mobile particle and stationary particles. The bead motion has been experimentally investigated in an inclined channel. Measurements of particles trajectories have been performed using a high-speed video camera. The main control parameters used to describe motion are: (1) the ratio of the bed particle diameter to the mobile-particle diameter, (2) a Shields-like number, (3) the bed slope, (4) the ratio of particle to fluid densities. Experimental results have shown that, in addition to the incipient motion issue, two motion regimes may be identified using these dimensionless numbers and that each regime may be characterised by a prevailing process. The saltation regime reached at large enough discharge is mainly controlled by the water flow. The rolling motion dynamics is dictated by particle interactions. A theoretical model for the rolling motion have been developed. Comparison between experimental data and theoretical results have shown a good agreement.