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Entrainment of solid particles by energetic flow events

MANOUSOS VALYRAKIS, Virginia Tech — The focus of this research study is to investigate the utility and applicability of a recently proposed criterion for the prediction of incipient entrainment of sediment particles. Recently introduced theoretical frameworks and stochastic approaches are presented. At near incipient flow conditions the magnitude of energetic flow events follows a power law distribution, over a wide range of frequencies, similar to many other geophysical phenomena. This implies that highly energetic flow structures, which have a good potential of impinging on an exposed particle and displacing it downstream, occur less frequently. This is in agreement with the intermittent and episodic character of particle entrainment observed from mobile particle flume experiments at low flow stages. Further, analysis of synchronous time series of particle entrainment and local instantaneous flow upstream of it, allows for extraction and characterization of the scales and magnitudes that are relevant to the displacement of individual particles. In addition to having a sound theoretical basis, the modeling approach is shown to perform well in accurately defining the condition of incipient motion and various levels of probability of particle entrainment.

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