

Double-average characteristics of sediment motion in one-dimensional bed load

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Abstract

The sediment transport process on a flat bed was investigated experimentally, with reference to the relationship between the average solid discharge and the concentration and velocity of the moving grains. The instantaneous values of the quantities were measured and, therefore, it was possible to quantify the contribution of the temporal fluctuations of concentration and velocity to the resulting average sediment transport rate. Recognizing that the sediment transport process is an episodic phenomenon, an intermittency factor was defined and its contribution to the solid discharge, typically implicit in earlier formulations of the sediment flux, was highlighted. Conceptual analyses of the spatial scale dependence of the quantities were also made.

Key words: sediment transport, grain concentration, grain velocity, intermittency.