



An experimental study on bedload transport measurements in a steep flume

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A laboratory flume for bedload transport experiments has been constructed at the Institute of Mountain Risk Engineering at the University of Natural Resources and Life Sciences, Vienna. The flume is 6 m long, 0.25 m wide and the inclination can be varied up to 25 %. The main purpose of this contribution is to report about bedload transport measurements, using continuous direct and indirect methods, which are applicable in the field. Therefore a systematic investigation with 100 experiments has been carried out. The channel gradient has been varied from 2.5 % up to 25 %. For each adjusted slope the discharge as well as the sediment supply were varied.

To measure bedload transport, three different measuring arrangements are used. First of all a geophone, comparable with the devices in several torrents and mountain streams, was installed. The geophone is fixed on a steel plate and the vibrations triggered by the transported bedload are recorded. The analysis of the collected information occurs on different ways. The peak over threshold method counts the number of impacts, which exceeds a certain value. Whereas the integration of the signal amplitude over time can be related with the volume of the transported particles. The frequency analysis of the signal is the third method. The assumption is, that the distribution of the frequency and the corresponding amplitude change with the transport intensity.

The second measuring arrangement is a bedload balance. The normal stress in combination with the flow height is recorded. Therefore a load cell and a pore water pressure indicator were installed in the channel bed. Additionally the flow height is measured with an ultrasonic device mounted directly over the load cell. With the relationship between the parameters the amount of sediment transported, is estimated.

The influence of the transported bedload on the forces acting on the channel bed is also investigated. Therefore the forces in longitudinal direction of the flume are recorded and compared with the calculated shear stress. A correlation between the standard deviation of the force measurement and the transported bedload volume can be found.