Geophysical Research Abstracts
Vol. 15, EGU2013-4116-1, 2013
EGU General Assembly 2013

Field measurements of the energy delivered to the channel bed by moving bedload

Jens Turowski (1,2), Martin Böckli (1), Dieter Rickenmann (1), and Alexander Beer (1)

(1) Swiss Federal Research Institute WSL, Mountain Hydrology and Torrents, Birmensdorf, Switzerland (jens.turowski@wsl.ch, +41 44 7392 215), (2) Helmholtz Centre Potsdam, GFZ German Research Centre for Geosciences, Telegrafenberg 14473 Potsdam, Germany

In physically-based theories of fluvial bedrock erosion the rate of incision is proportional to the energy delivered to the bed by moving bedload. We have measured this energy in four streams in the field with an indirect sensor for bedload monitoring based on commercially available geophones, using a laboratory-derived calibration. Similarly to bedload transport rates, the energy delivered to the bed is dependent on discharge, but shows strong stochastic fluctuations spanning several orders of magnitude at a given discharge. We show that the ratio of the energy delivered to the bed to the total energy available to the stream is strongly correlated to the mean discharge and the mean discharge per unit width for the measurement period. An empirical model for long-term fluvial bedrock erosion based on these observations is similar to the stream power model, when a term describing the shielding effect of sediment (the cover effect) is included. However, this model cannot be applied to short-term periods. Our observations have implications for the use of erosion models in landscape evolution modeling.