Geophysical Research Abstracts
Vol. 12, EGU2010-11212, 2010
EGU General Assembly 2010
© Author(s) 2010

Debris flow entrainment: a comparison of direct measurements with sediment budget calculations at the Illgraben catchment

Catherine Berger (1,2), Brian McArdell (1), and Fritz Schlunegger (2)

(1) Swiss Federal Research Institute WSL, Avalanches, Debris Flows and Rockfall, Birmensdorf, Switzerland (catherine.berger@wsl.ch), (2) Institue of Geological Sciences, University of Bern, Switzerland

Debris flows typically entrain sediment along the flow path, thereby increasing the volume of the flow. The entrainment process is poorly understood, yet vitally important in hazard analysis. Here we investigate debris flow entrainment by comparing direct measurement of entrainment with entrainment estimated from sediment budget calculations at the Illgraben catchment in Switzerland.

A sensor for measuring debris flow erosion is described in Berger et al. (2010, in press, Water Resources Research). The sensors are buried in the channel bed and record the depth and timing of debris flow entrainment during a flow. Results using this sensor show that the entrainment in a large debris flow (front flow depth larger than 2 m) occurs near the front and that the magnitude is up to approximately 1/4 of the flow depth.

A sediment budget for the Illgraben catchment was constructed using a variety of data sources including photogrammetric analyses of sediment sources and sinks as well as estimates of debris flow volume made at the outlet of the basin using the data from the debris flow observation station. The photogrammetric analyses document individual landslides scars, the formation of in-channel sediment storage areas, and their subsequent removal by sediment transfer processes (e.g. debris flows and flood flows). The typical debris flow has a volume generally an order of magnitude larger than the typical landslide. Additionally, the sediment yield within the debris flow initiation area is typically smaller than the median debris flow. These observations provide strong support for the idea that debris flow entrainment along the flow path is an important process.