



The Materosion project, a sediment cascade modeling for torrential sediment transfers: final results and perspectives

Benjamin Rudaz (1), Alexandre Loye (1), Benoit Mazotti (1), Eric Bardou (2), and Michel Jaboyedoff (1)

(1) Center of Research on Terrestrial Environment (CRET), University of Lausanne, Switzerland, (2) Center for Alpine Research (CREALP), Sion, Switzerland

The Materosion project, conducted between the swiss canton of Valais (CREALP) and University of Lausanne (CRET) aims at forecasting sediment transfer in alpine torrents using the sediment cascade concept. The study site is the high Anniviers valley, around the village of Zinal (Valais).

The torrents are divided in homogeneous reaches, to and from which sediments are transported by debris flows and bedload transport events. The model runs simulations of 100 years, with a 1-month time step, each with a given a random meteorological event ranging from no activity up to high magnitude debris flows. These events are calibrated using local rain data and observed corresponding debris flow frequencies.

The model is applied to ten torrent systems with variable geological context, watershed geometries and sediment supplies. Given the high number of possible event scenarios, 10'000 simulations per torrent are performed, giving a statistical distribution of cumulated volumes and an event size distribution.

A way to visualize the complex results data is proposed, and a back-analysis of the internal sediment cascade dynamic is performed. The back-analysis shows that the results' distribution stabilize after $\sim 5'000$ simulations. The model results, especially the range of debris flow volumes are crucial to maintain mitigation measures such as retention dams, and give clues for future sediment cascade modeling.