



## **Experience from an indirect bedload transport measuring system with geophone sensors**

Dieter Rickenmann (1), Jens M. Turowski (1), Jonathan B. Laronne (2), Ronel Barzilai (2), Helmut Habersack (3), and Hugo Seitz (3)

(1) Swiss Federal Research Institute WSL, Mountain Hydrology and Torrents, Birmensdorf, Switzerland (jens.turowski@wsl.ch, +41 44 7392 215), (2) Ben Gurion University of the Negev, Israel, (3) University of Applied Sciences BOKU, Vienna, Austria

Bedload transport measurement in natural streams is a challenging task, particularly at flows with high shear stresses in gravel and boulder bed streams. Indirect methods for measuring bedload transport offer an interesting possibility for continuous and non-intrusive monitoring of bedload transport activity. Geophone sensors as used here are acoustic devices that sense and record the motion of colliding bedload particles. We have deployed geophone sensors and bedload impact sensors (PBIS) for more than 20 years in different stream settings, using a standard configuration with the sensor fixed underneath a steel plate, which is installed flush with the streambed, for example on a check dam. Geophone sensors are now used at research sites in several streams to monitor bedload transport activity, and to further develop this surrogate measuring technique to better quantify bedload transport in gravel and boulder bed streams. At some of these sites, direct bedload measurements were performed for calibration purposes, using Helley-Smith type samplers, slot samplers and moving metal baskets. We report our experiences with this robust indirect bedload transport measuring system, and we discuss insights from a comparative analysis of field-based calibration measurements and from flume experiments.