Geophysical Research Abstracts
Vol. 14, EGU2012-7433, 2012
EGU General Assembly 2012
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Field measurements of bedrock erosion driven by bedload impacts

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River incision and coupled hillslope evolution is fundamental in shaping the earth surface. In mountainous regions with steep river beds, bedrock erosion by fluvial sediment transport is an important mechanism forming channels. Jointed rocks are prone to plucking, and in massive rocks abrasion is the dominant erosion process. However, there is only few field data linking discharge, sediment transport, impact energy and erosion existing that can be used for process understanding and model evaluation.

To provide an appropriate simultaneous dataset of hydraulics, sediment transport and bedrock erosion at high temporal and spatial resolution, a new measuring setup has been assembled. Two stone slabs were installed in the Erlenbach, a gauged stream in the Swiss Pre-Alps. Force sensors under the slabs record vertical pressure and downstream shear. Sediment transport is measured with geophone plates, and with an automated moving basket system taking short-term sediment samples. Both systems are located directly downstream of the stone slabs. Erosion rates are measured with erosion sensors at sub-millimetre accuracy at three points on each slab, and by changes in slab topography surveyed with photogrammetry after flood events.

Since the installation of the slabs, bedrock erosion has been observed during a transport event with a peak flow of 1.1m3/s. We show preliminary results discussing the relation between erosion rates, the forces on the stone slabs, bedload transport rates and hydraulics.