Geophysical Research Abstracts
Vol. 15, EGU2013-7513-1, 2013
EGU General Assembly 2013
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High resolution structured light epoch scanning of natural bedrock erosion

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The Earth‘s surface is shaped by the interaction of uplift and downwearing. A prominent process of downwearing in steep environments is bedrock erosion by mountain streams, carving into genuine rocks by means of transported sediments as erosion tools. Field measurement of natural bedrock surface changes parallel to sediment transport observations is basic to investigate the processes and rates of channel development. However since bedrock erosion commonly is a slow process of below 1mm/a, it is hard to measure and even more difficult to monitor. Therefore a highly precise and accurate submillimetre surveying technique is necessary to gain data in the field.

Here we present the application of a new structured light scanner (GOM ATOS Compact Scan 5M) in a fluvial environment. This triangulation scanner uses blue light technology, so it is applicable under indirect sun light and can even be applied to surfaces without structure, which pose a problem for example for close-range photogrammetry. It requires external power supply but has dimensions to be reasonably transported in the field with a car. Digital elevation models of the surface are automatically generated in the field and so possible poor imaged sections can be rescanned directly.

Repeated surveys of a concrete 600*360mm slab installed flush to the streambed in a small creek in the Swiss Pre-Alps could be conducted at a spatial resolution of 0.1mm and lie within an accuracy of 0.1mm. We examine the patterns of the erosional work of several floods that caused abrasion of the slab in the order of some millimetres at exposed positions relative to the flow. These measurements are part of a field monitoring project of bedload-impact related bedrock erosion and shall contribute to evaluation of erosion models crucial to understanding of landscape evolution.