Field calibration of signals from surrogate techniques for gravel and cobble bedload

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Abstract. Because direct measurement of bedload transport is difficult, indirect or surrogate techniques are being developed. Surrogate techniques for gravel transport measure signals that are created by particles hitting each other or an underwater sensor (e.g., microphone) or by magnetic bedload particles passing over coils implanted into the streambed. Signal rates measured in the field need to be calibrated in order to provide a meaningful description of bedload transport rates and particle sizes. Lab tests typically produce bedload signals with a narrower set of properties and patterns than a stream by reducing electronic noise, by having lower transport rates, a smaller range of particle sizes, and lacking temporal and spatial variability of bedload transport.

Lack of a suitable sampling device is the major obstacle for necessary field calibration; vortex samplers, weighable pit traps and debris basins require significant stream installations, while handheld samplers tend to lack accuracy. Other difficulties are high temporal and spatial variability of bedload transport as well as interference between the calibration and the surrogate device. Bedload traps overcome many of these difficulties. They are available (i.e., portable, relatively easy to fabricate, install and operate) and have performed satisfactorily in many field deployments and recent lab tests. Bedload traps permit relatively long sampling times and can average over temporal variability. Several traps can be installed next to each other to cover the stream width and average over lateral variability. Bedload traps appear to be a suitable device for field calibration of surrogate techniques in wadeable coarse gravel-bed streams.

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