

## Field experiments on bedload transport using distributed acoustic sensing

Torrents are characterized by steep catchments with intense bedload transport. In the summer of 2024, numerous floods occurred in Ticino and Valais with elevated bedload transport, resulting in flooding and damages of infrastructures. These events highlight the urgency to improve the quantification of bedload transport processes in torrents, where the application of traditional bedload transport yields unsatisfactory results.

The Swiss plate geophone (SPG) system was developed at WSL and allows for continuous bedload transport measurements. SPGs are installed on the channel bottom (Fig. 1a) and can translate the impact of individual sediment grains to an electric signal, whereas the signal intensity and frequency can be correlated with the mass and volume of the sediment. However, this system is restricted to cross-sections with installed SPGs. A promising alternative to measure bedload transport along a longer distance is "Distributed Acoustic Sensing" (DAS). When sediment grains bounce on the ground, they release seismic waves, which generate vibrations that propagate long distances. Such vibrations stretch and compress fiber optic cables within the ground sufficiently to be detected by DAS.



Fig. 1: (a) Installed SPGs and (b) impression of wood and bedload transport at the Erlenbach

The student(s) will perform field experiments at the Erlenbach (Canton Schwyz, Fig. 1b). Specifically, fiber optic cables will be installed up- or downstream of the existing SPGs to measure bedload transport. Sediment baskets will enable the validation of the results using both approaches. This thesis aims to contribute to the development of the novel technique to quantify bedload transport using DAS and compare the findings with SPGs. This thesis is a collaboration with WSL. The student(s) will have a working desk at WSL in Birmensdorf and will be integrated in the research group of "Torrents and Mass Movements".

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**Remarks:** Field experiments;  
Project language: English or German;  
1 student for Master's thesis or up to 2 students for project work