

# Bedload trap measurements as part of an integrative measurement system



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## Introduction

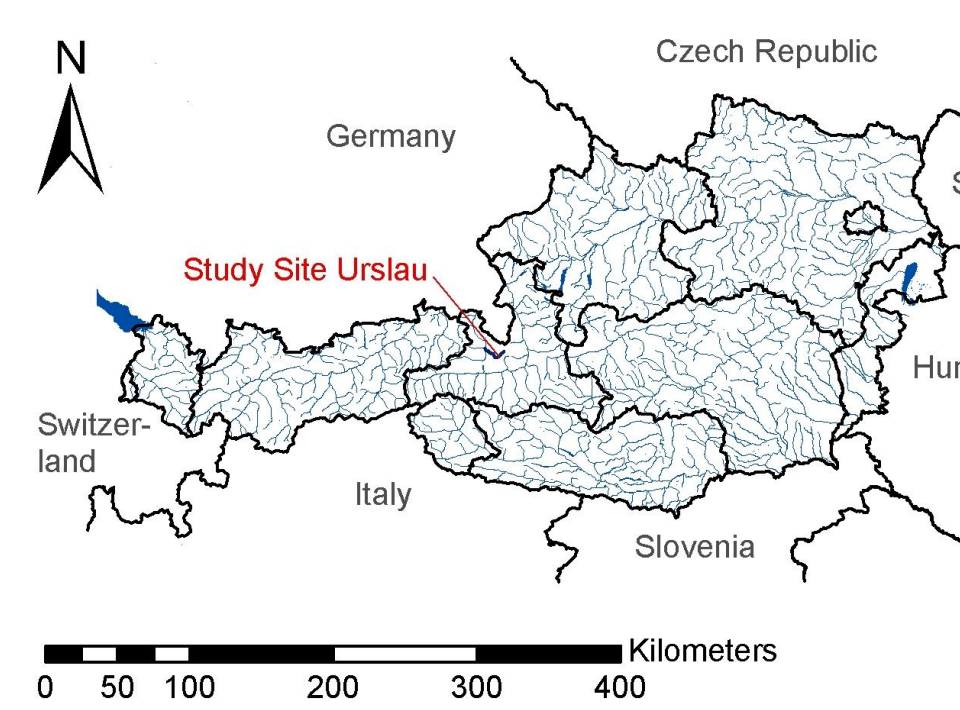
Data of bedload transport form the fundamentals of planning in the fields of river engineering, flood protection, torrent control and waterway management. Furthermore, bedload information is needed for issues concerning ecology and hydropower. In addition, bedload transport measurements are essential to select, apply and calibrate bedload transport formulas and numerical models. Bedload traps enable continuous and automatic bedload transport measurements. Thereby, the method is applicable for all water stages, especially during floods, when other sampling methods are not operable anymore. Besides, it facilitates the determination of the complete grain size spectrum.

At the mountain torrent Urslau (Austria/Salzburg) a fixed bedload trap forms an indispensable part of the 2010 installed integrative bedload measurement system, including a geophone device and mobile basket samplers.

## Study Site

The mountain torrent Urslau is located in the alpine region of Austria and discharges at Saalfelden into the Saalach River. Bedload transport is monitored since 2011.

Drainage Basin (measuring site)	[km <sup>2</sup> ]	55	Bedslope (average)	[%]	11.3
MQ (1951-2008) (Saalfelden)	[m <sup>3</sup> s <sup>-1</sup> ]	4.41	Bedslope (upstream measuring site)	[%]	2.4

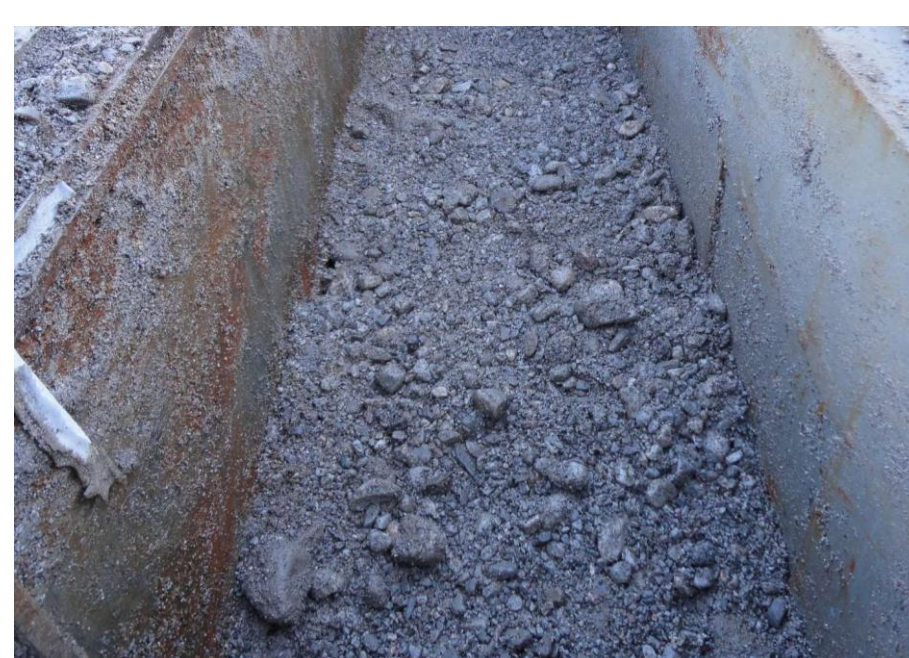


## Methods

The bedload trap contains a sample box which is placed on load cells. The lid covering the sample container has a longitudinal sampling slot. To start bedload sampling the slot is opened hydraulically via manual control, enabling bedload material to be trapped into the container. The load cells commence recording automatically the mass increase within the trap. The bedload trap is mounted directly upstream of the geophone device in the middle of the cross-section. A relation of impulses by the geophones and transported bedload material is possible.



Sampling box



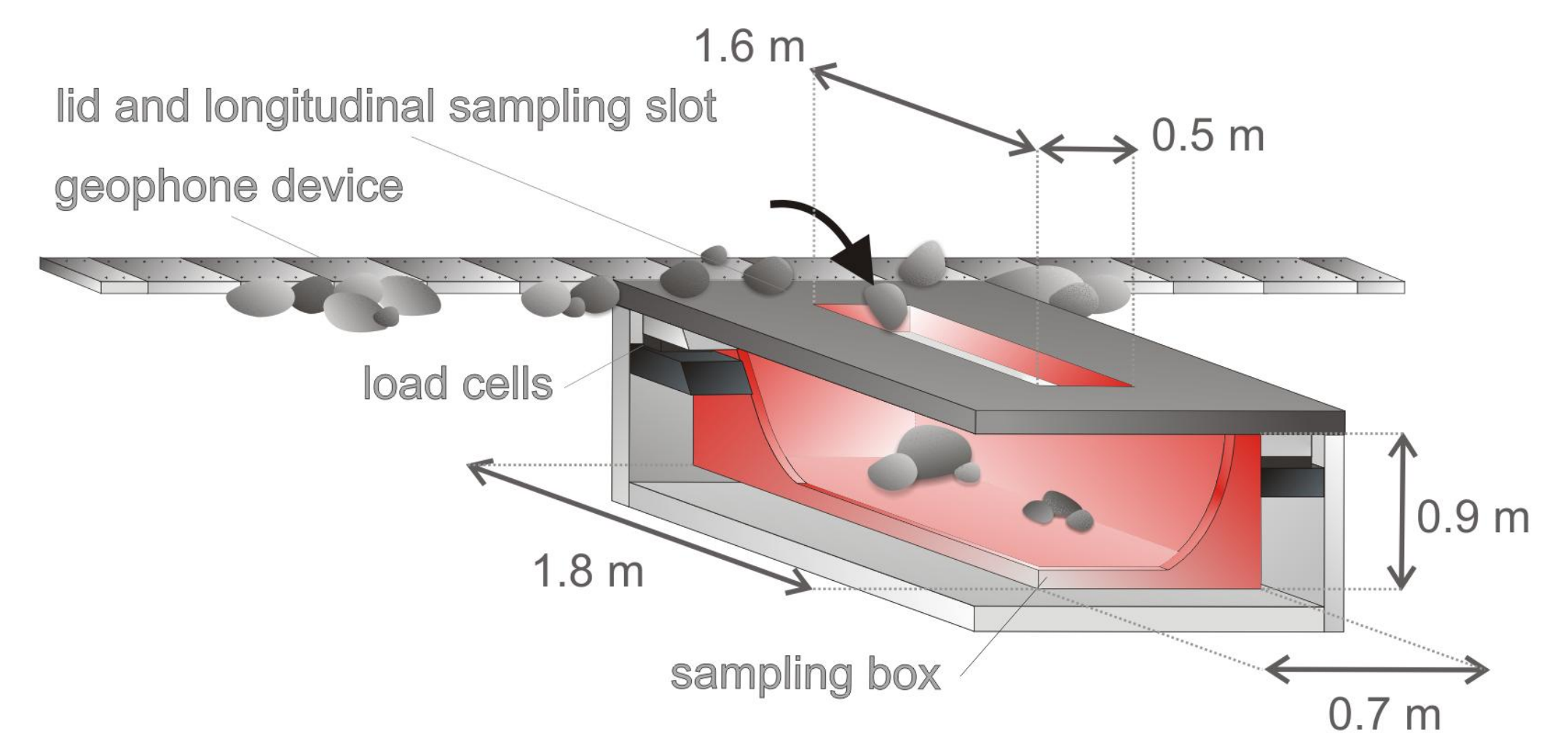
Bedload sample



Lid and sampling slot



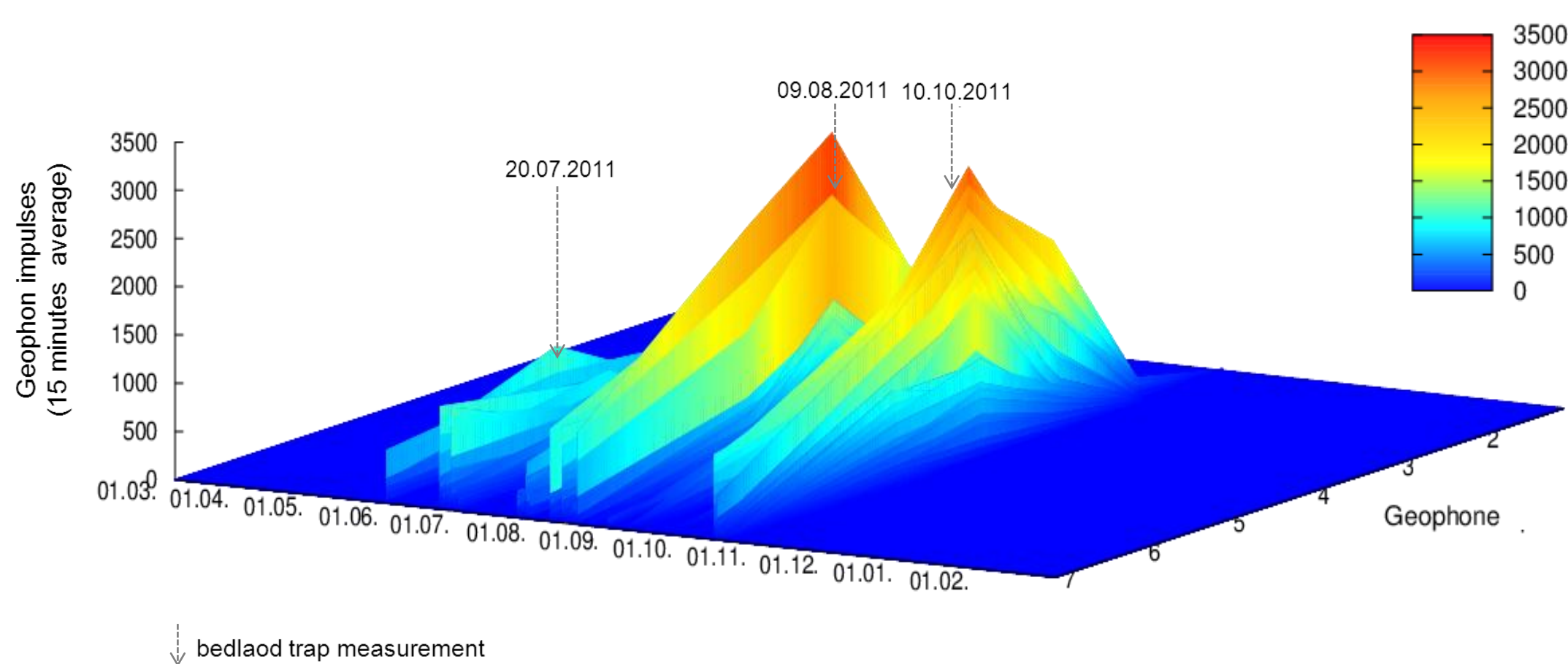
Load cells



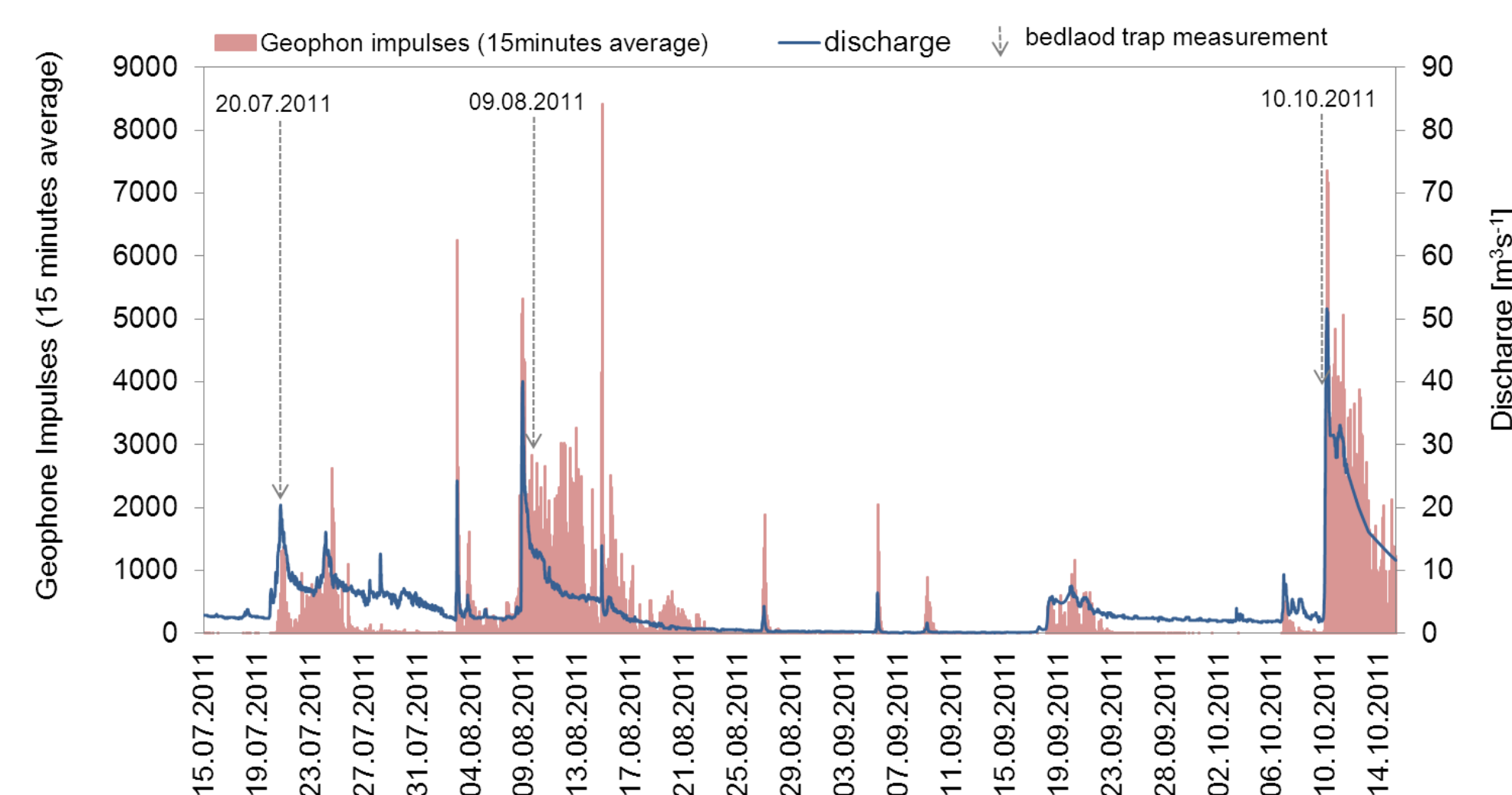
## Results

The integrative measurement system allows an automatic and continuous recording of bedload transport in the Urslau torrent. Bedload transport measurements, using a mobile basket sampler and a bedload trap, have been conducted at the highest flow events in 2011. A good agreement between direct (mobile basket sampler, bedload trap) and indirect (geophones) measurement methods is shown in the graph below.

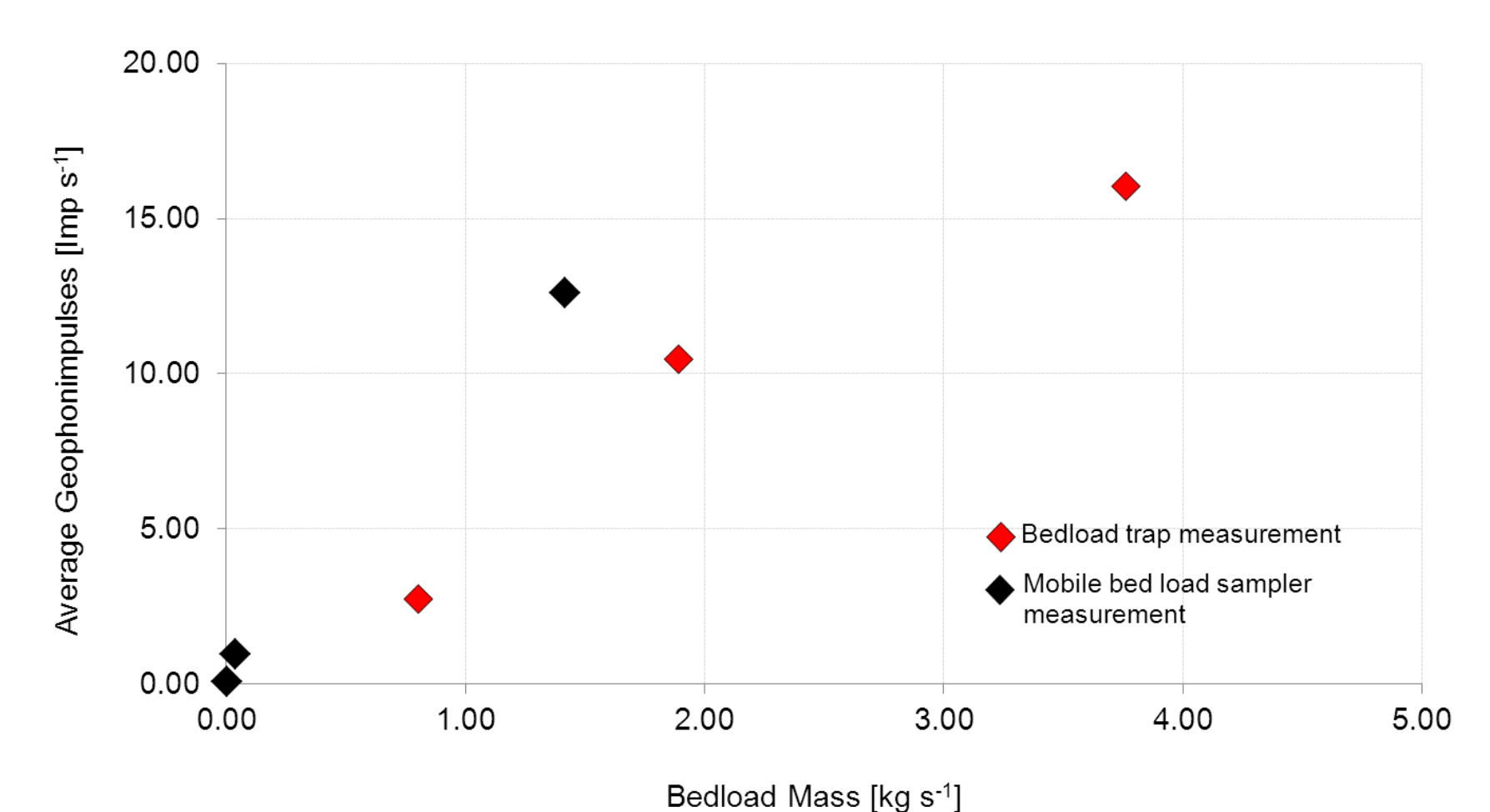
Temporal and spatial distribution of Geophone impulses Urslau (01.03.2011 – 28.02.2012)



Geophone Impulses, Bedload trap measurements and Discharge Urslau (15.07.2011 - 15.10.2011)



Correlation of bedload transport measurements and geophone impulses (Bedload measurements Urslau 2011)



## Outlook

Bedload monitoring and analyses at the measuring site Urslau will be continued until 2014. The project aims to develop an applicable method for downstream sections of mountain torrents to assess bedload transport and to review existing approaches to calculate bedload transport using measured data and to work out possibilities to calibrate and adjust bedload transport formulas. A general suggestion to determine bedload transport of downstream sections of mountain torrents should be given.



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