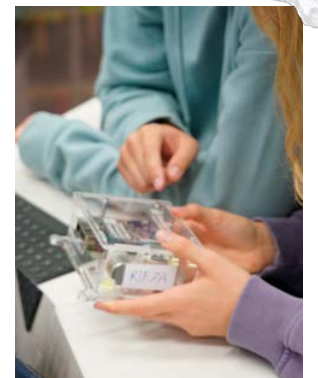


A hands-on school project to engage children with seismic monitoring and deep geothermal energy

Azzola Jérôme, Andrea Huber, Judith Bremer

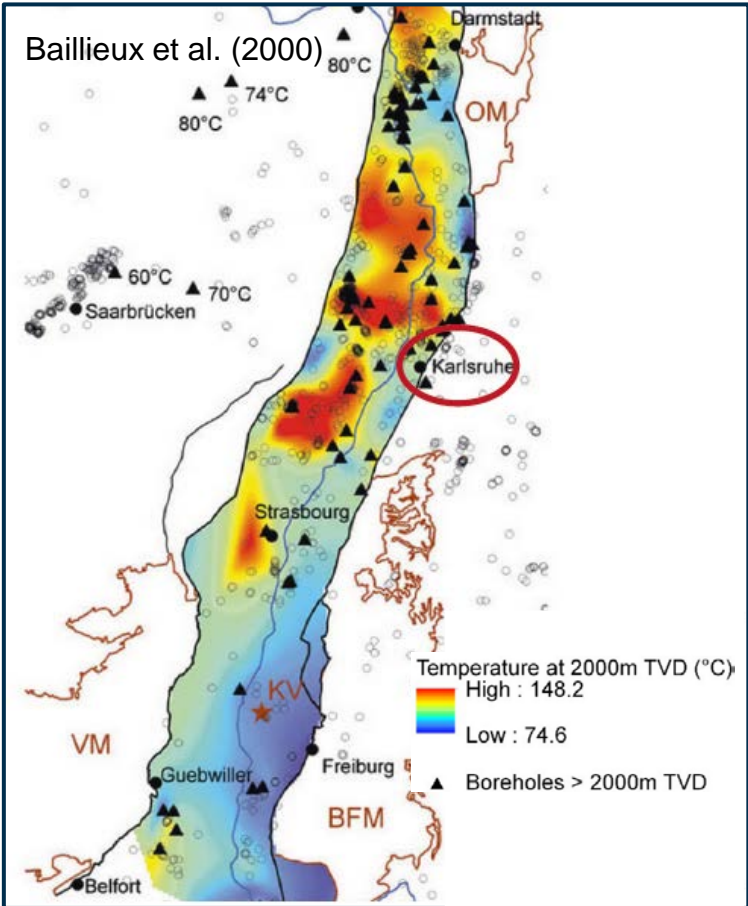
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Dept. Geothermal Energy and Reservoir Technology



Research Context

The Upper Rhine Graben

- Elevated geothermal gradients
- Favourable conditions for production of heat/electricity from geothermal energy
- Several projects (in operation, development, or planning)



Motivations

Public perception challenges

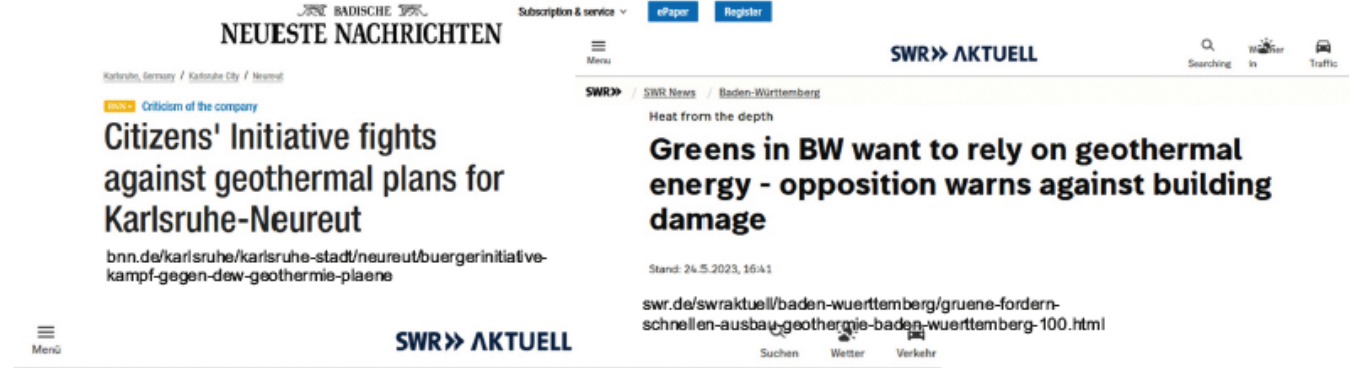
- Strongest at the local level
- Concerns about induced seismicity

Underlying factors

- Complex scientific concepts, difficult to communicate
- Misunderstanding, mistrust and limited dialogue
- Few opportunities for public engagement

Our approach

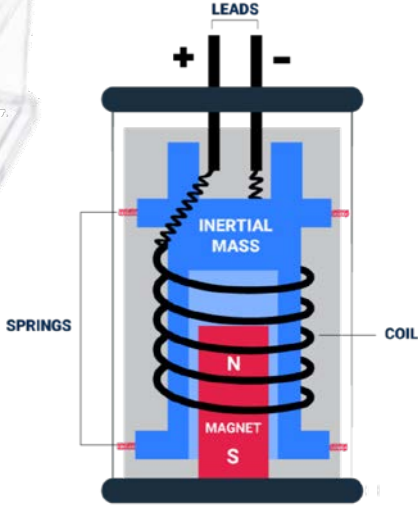
- Foster active exchanges with citizens
- Combine geophysics, geosciences with social sciences and communication expertise
- Different formats
 - School projects



Including Geophysics

Raspberry Shake 3D (RS3D) as a learning tool

- 3-component sensor: users make real seismic observations
- Compact system: sensor + datalogger in one unit
- User-friendly: Raspberry Pi / Linux-based
- Cost-effective: installation of large dense networks, also in schools
- Open data: access to a global network of stations



raspberryshake.org

stationview.raspberryshake.org



KIT

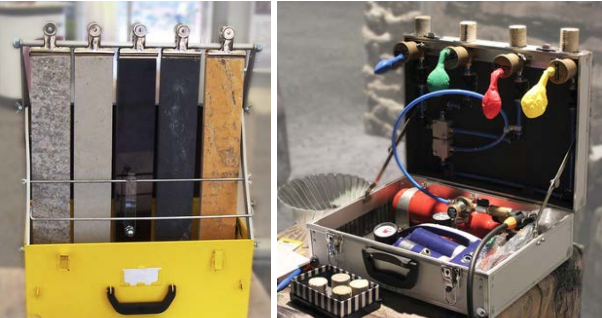


School projects for educational outreach

- Structured in 3 - 5 modules (2-3 school hours), target pupils btw 13 and 16
- 1 session in classrooms (illustration of concepts, experiments/activities), then data collection/processing/interpretation
- Hands-on approach: Activities & experiments, fieldwork, data processing
- Two formats: Role-playing game and competitive format
- Impact: Broad learning scope (multiple tasks, topics, and skills), interactive learning, engagement with scientists



Visit of geothermal power plant (EnBW)

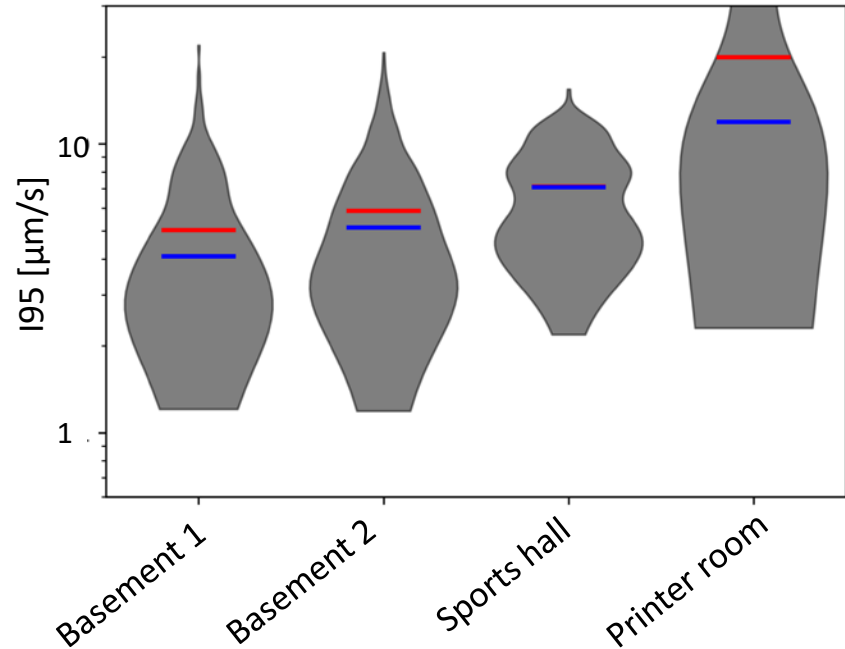
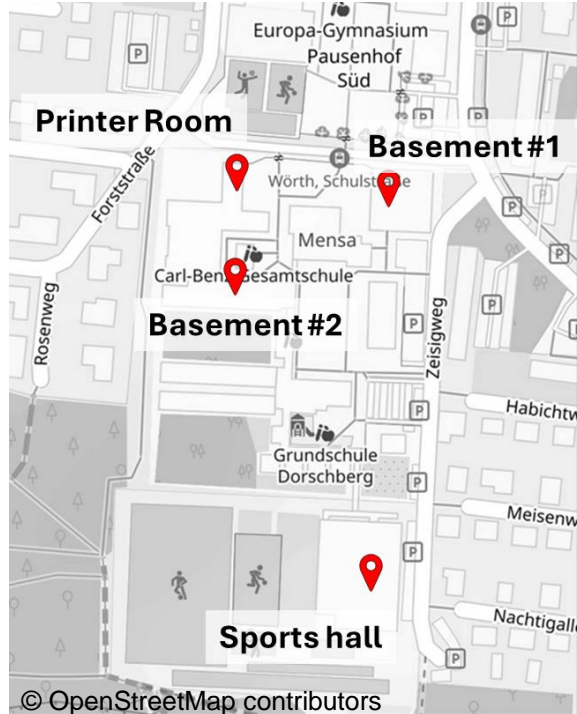
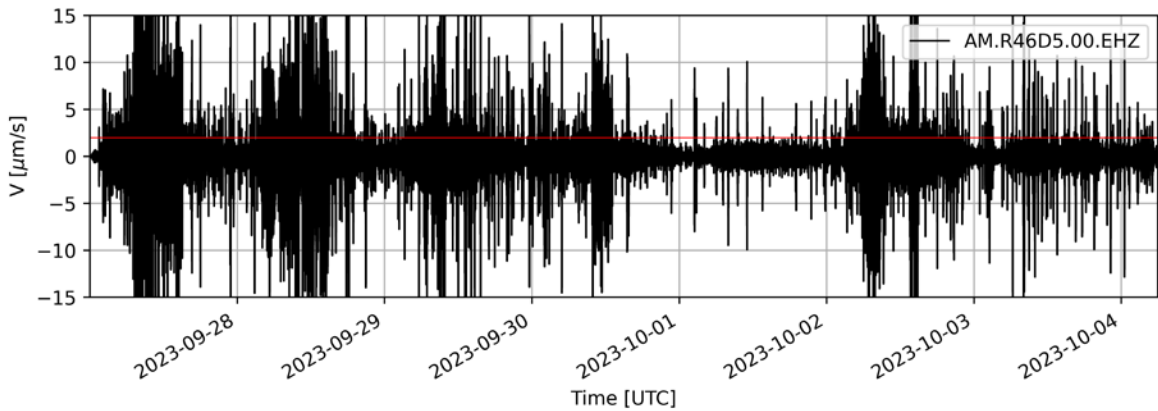


Small experiments (LFZG)

Producing Geophysical observations

The competitive approach

- Pupils are made aware that ground shakes constantly, at different levels
- 1 Raspberry Shake stations / group
- 2 objectives
 - Find the site with highest level of noise
 - Find the site with lowest level of noise
- Pupils decide where to install their station and operate it for 2 weeks
- Data analysis (already programmed Python codes)
 - Visual inspection of waveforms
 - Statistical approach to estimate background noise levels



Evaluation and dissemination

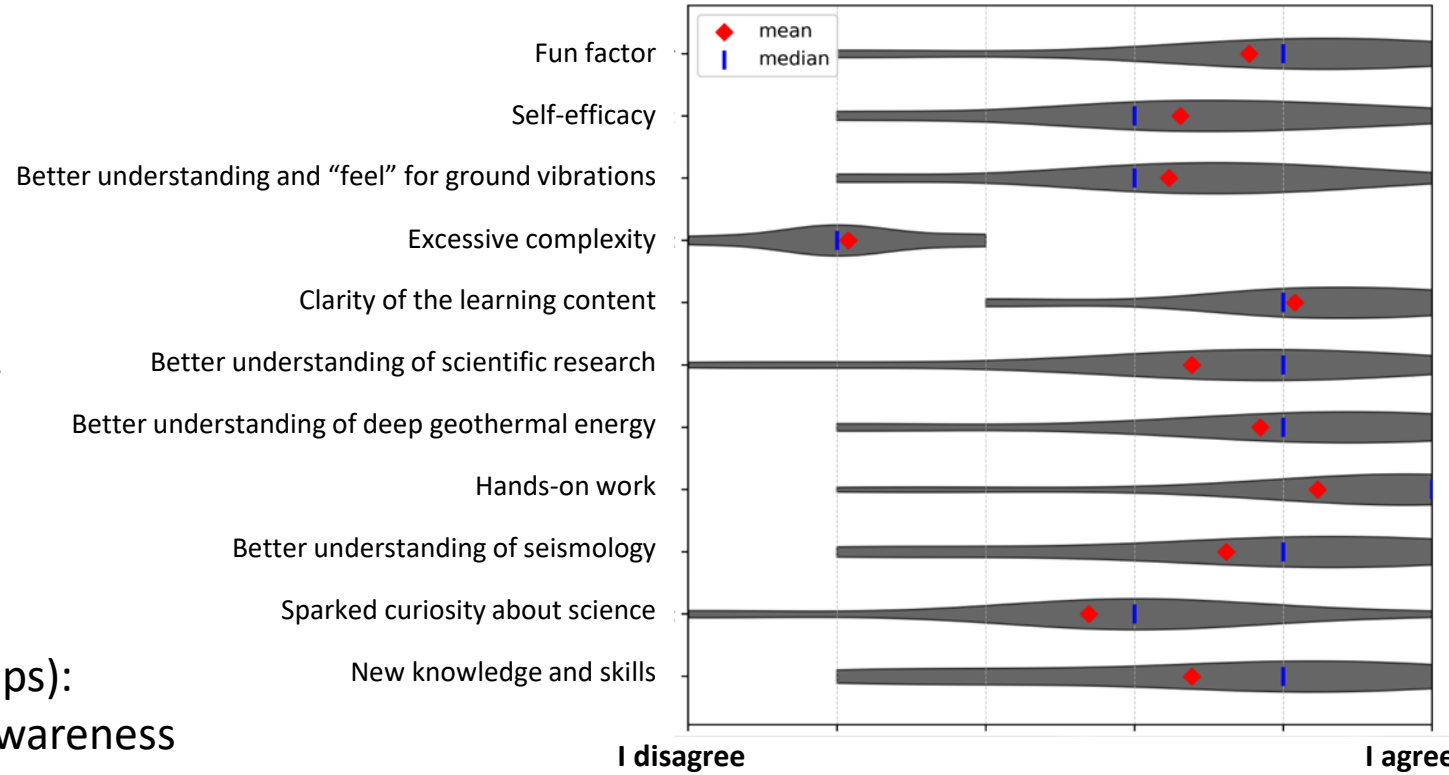
Evaluation

- A survey before / after tacking part to the project
- Based on self-evaluation of knowledge

“I was surprised to learn that our region has such great potential for energy production.”

Dissemination

- Students have active social circle (home, friend groups): contribute to the multiplication of knowledge and awareness
- Project presentations: teachers' conference, school-wide parents' evening, newspapers, ...



Take Home messages

- **Geophysics can be a powerful tool for engagement**

Simple instruments like Raspberry Shake make complex concepts accessible beyond the scientific community.

Everyday vibrations (traffic, environment) become a gateway to understanding Earth processes and seismic monitoring.

- **Hands-on learning is key**

Actively involving students in measurements and data analysis leads to deeper understanding and lasting impact.

Makes it possible to cover various fields, use and validate various skills / knowledge

- **Students as ambassadors**

School projects don't stop in the classroom — students spread knowledge and awareness within their social circles.

These formats can be adapted to other regions, topics, and infrastructures.

Report ([10.5445/IR/1000191402](https://doi.org/10.5445/IR/1000191402))



Resources ([10.5445/IR/1000182024](https://doi.org/10.5445/IR/1000182024))



Paper ([10.5445/IR/1000168939](https://doi.org/10.5445/IR/1000168939))



Thank you for your attention

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<https://stationview.raspberrypi.org/#/>

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