SUPPLEMENTARY MATERIAL VOLCANICA

Supplementary Material for: Subglacial volcano monitoring with fiber-optic sensing: Grímsvötn, Iceland

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Klaasen et al. (2023) should be cited if this material is used independently of the article.

TECHNICAL DETAILS

Acquisition Parameters	
Sampling frequency (Hz)	200
Time decimation	5
Spatial resolution (m)	8
Spatial averaging / P - value	1
Gauge length (m)	10

Fiber

The fiber was chosen due to our previous experience with this type of fiber in the field. We used this fiber at an experiment on the Rhone glacier in the summer of 2020 (no publications yet). During the field campaign on the Rhone glacier this fiber was relatively easy to handle in terms of weight. During the fieldwork in Iceland, we discovered that we could handle the fibers easily with the snow cat and snow scooters. In future experiments, we could consider bringing heavier/more robust fibers that may yield a higher data quality. The choice in fiber is often a trade-off between fiber quality/robustness and the ability to manage the fiber in the field.

Sampling frequency

The sampling rate of 200 Hz was chosen to reduce the data volume. At the time that we took this decision, we were not aware that lowering the sampling rate to 200 Hz may elevate the optical noise floor. However, the lower data volume was incredibly beneficial in the data analysis. Given that the data quality is still sufficiently high for our analysis, we think this trade-off may be worth it.

Power source

We used a generator as a power source, combined with batteries. The generator would run for a few hours to power the interrogator and charge the batteries, after which the interrogator would be powered by the batteries for a few hours. The generator was already present at Grímsfjall, as part of the research infrastructure in the huts.

Noise from the generator

The interrogator often needs to be installed near its power source, a generator, which can cause shaking of the interrogator which is transferred to the channels on the measuring fiber. This was, fortunately, not an issue for our experiment. There are three huts on top of Grímsfjall, and the power generator and interrogator were in separate huts, as far away from each other as possible. The physical distance between them would be roughly 50 m. Additionally, the interrogator was placed on an anti-vibration plate, to minimize any shaking from the interrogator.

The first ~100 m of the fiber-optic cable was trenched into a larger pipe, which caused bad coupling with the ground, but protected the fiber in the area close to the huts with higher traffic. Consequently, we did not use this first 100 m of fiber in any analysis. The remaining fiber was sufficiently removed from the power generator that we did not see this signal anywhere in the data.

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