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Continuous seismic monitoring of a geothermal project using Distributed Acoustic Sensing (DAS): a case study in the German Molasse Basin.

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Distributed Acoustic Sensing (DAS) in geothermal wells is a particularly attractive technology to implement as part of routine seismic monitoring of geothermal plant operations. It brings a large network of sensors close to the monitoring target – the operated reservoir – increasing the sensitivity towards low magnitude events and allows the application of processing procedures inspired by large network or array processing. However, the technical management of the large flow of produced data and the suitability of the strain-rate acquisitions to monitor locally induced seismicity was yet to be fully assessed.

We present the results of a continuous 6-month monitoring period that aimed at testing an integrated system designed to manage the acquisition, the processing and the saving of DAS data collected from behind casing at the Schäftlarnstraße (SLS) geothermal project (Munich, Germany). The data management system links the existing on-site infrastructure to a cloud Internet-of-Things (IoT) platform integrated into the company's IT infrastructure. The cloud platform has been designed to deliver both a secure storage environment for the DAS records and optimized computing resources for their continuous processing.

With a special focus on seismic risk mitigation, we investigate the potential of the monitoring concept to provide sensitive detection capabilities, despite operational conditions, while ensuring efficient data processing in order to strive for real-time monitoring. Further analysis of the records confirm additional logging capabilities of borehole DAS. We also evaluate the ability of DAS to provide reliable seismic source description, in particular in terms of location, moment magnitude, and stress drop.

Using two detected local seismic events, we demonstrate the relevance of the system for monitoring the SLS-site in an urban environment, while complementing advantageously the surface seismometer-based monitoring network.