Report of Transnational Access Projects

(Note: the information here will be publicly disclosed in the Geo-INQUIRE website, do not include sensitive information)

Project ID: *C4-TA3-83-6*

Principal investigator: Alexander Yates, *Université libre de Bruxelles, https://orcid.org/0000-0003-3142-5004*

Project team (if applicable): *Corentin Caudron (Université libre de Bruxelles)*

Project title: Understanding Structural Controls on Seismic Signals at Volcanoes using Distributed Acoustic Sensing

Project acronym: USCV-DAS

Hosting installation: *Eastern Sicily – Distributed Acoustic Sensing (TA3-83-6), GFZ Helmholtz Centre for Geosciences (Germany) and Istituto Nazionale di Geofisica e Vulcanologia – Osservatorio Etneo (Italy)*

Hosting team: *Philippe Jousset (GFZ Helmholtz Centre for Geosciences), Gilda Currenti (INGV-Osservatorio Etneo)*

Period of access: *On site visit to GFZ Potsdam between February 9–17, 2026.*

Report of activities:

Onsite visit to GFZ Potsdam in February 2026 to access DAS datasets recorded on Mt Etna, in particular targeting a fiber optic cable passing between Linera to Zafferana which recorded data during a couple of months in both 2018 and 2019. During the visit, the data were downsampled and analyzed using open source python packages and scripts developed on-site towards identifying stable peaks in seismic spectra that could be related to a medium response.

To assess the feasability of recovering such stable peaks in the DAS data during the recording period, data from two nearby three-component seismic stations, operating concurrently inwith the DAS deployment, were analyzed. From these, stable peaks were identified consistent with previous observations at Mt Etna (Yates et al., 2026), also undergoing changes in frequency that appear related to environmental forcing. Specifically, evidence of a decreasing frequency of spectral peaks was identified at both stations in response to precipitation events (Figure 1), presumed to represent a change in the seismic velocity of the medium. A principle objective was therefore to identify similar peaks in DAS recordings and to assess their evolution in space in response to subsurface structure and heterogeneity.

Geo-INQUIRE is funded by the European Commission under project number 101058518 within the HORIZON-INFRA-2021-SERV-01 call

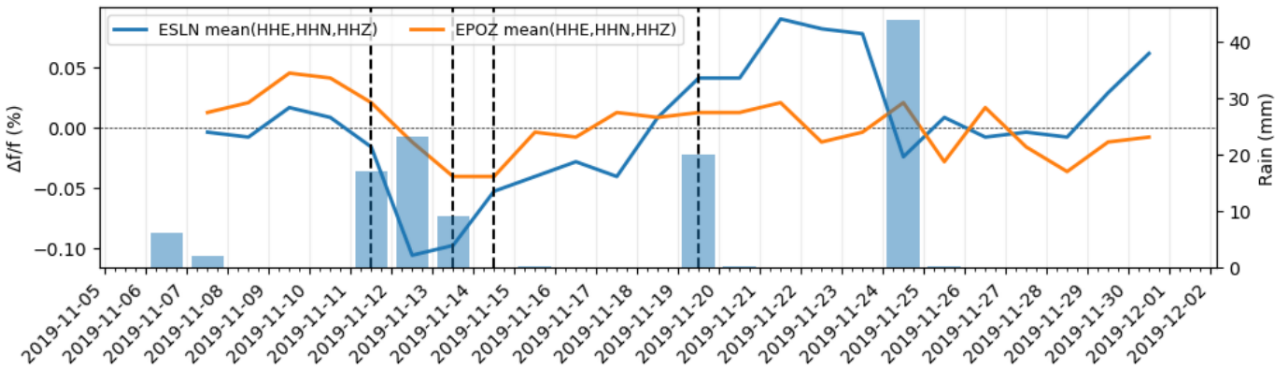

Figure 1: Frequency changes (Δf/f) in spectral peaks measured at two seismic stations (ESLN and EPOZ) during one month in 2019. Evidence of decreases in frequency are observed during three days of rainfall mid-November.

For much of the recording period of the DAS, the signal was found to be dominated by anthropogenic noise sources (e.g. Figure 2), particular between 06h00 and 22h00 (local time). Preliminary attempts to reduce the influence of these noise sources, while preserving features of the volcanic tremor wavefield, proved unsuccessful. In contrast, data recorded during the night and early morning reveals stable spectral peaks similar to those recorded using seismic stations (Figure 3). Future analysis will focus on exploring both the temporal stability of these peaks, and their modulation by external processes (e.g. seismic events, precipitation), and evaluating how they evolve in space along the different channels (e.g. determining the characteristic length scale over which the peaks remain similar).

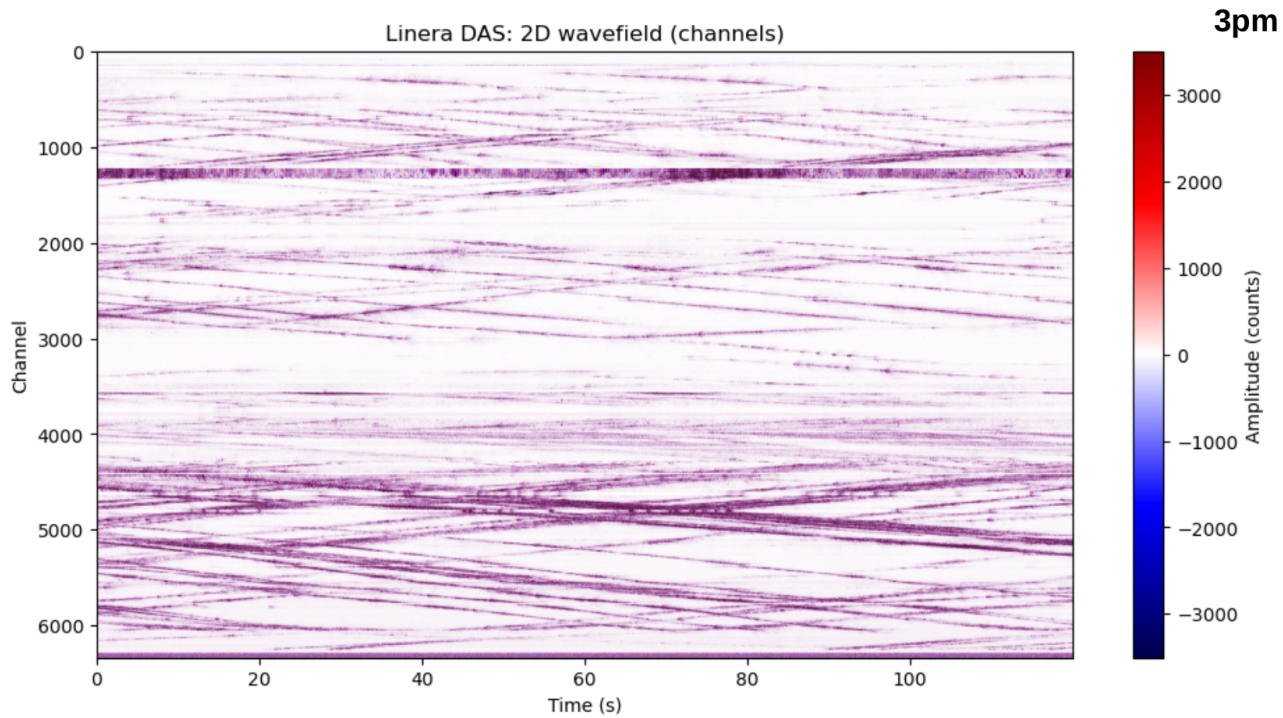

Figure 2: Two minutes of DAS recordings at 15h00 (local time) recorded along the full length of the cable, with anthropogenic sources clearly recognizable as coherent energy with pronounced moveout along the different channels.

Geo-INQUIRE is funded by the European Commission under project number 101058518 within the HORIZON-INFRA-2021-SERV-01 call

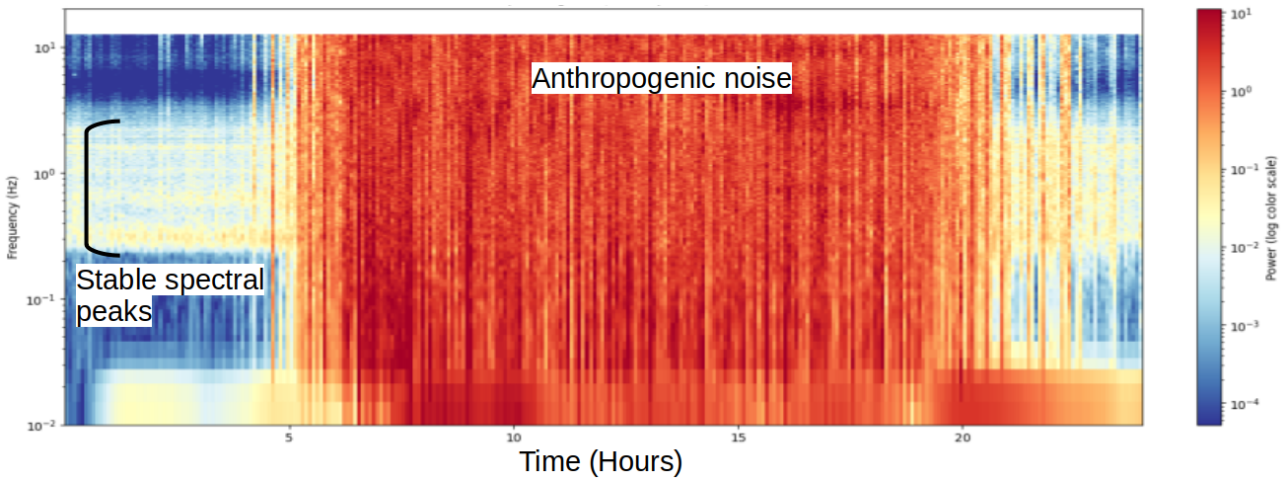

Figure 3: Spectrogram of one day of DAS recorded at a single channel. Significant periods are dominated by anthropogenic sources, which masks the background tremor wavefield. However, stable peaks can be recognized between 00h00 and 05h00 and after 21h00.

References:

Yates, A. S., Heuninck, S., Barajas, A., Bektas, H., Caudron, C., De Angelis, S., & Zuccarello, L. (2026). Tracking subsurface changes via frequency shifts in volcanic tremor spectral lines: observations from Mt Etna. Geophysical Research Letters, 53(2), e2025GL117819.

Project outcomes:

Preliminary results will be presented as a poster during the EGU Galileo conference on 'Fiber Optic Sensing in Geosciences' between 31 August and 4 September 2026. The abstract can be found at https://doi.org/10.5194/egusphere-gc14-fibreoptic-52 .

Note: Data, products, software and publications resulting from TA activities must be publicly accessible under a CC-BY 4.0, GPLv3 or equivalent open license. No embargos beyond June 2026 are allowed. They must cite Geo-INQUIRE as the source of funding. Minimal citation: "*Geo-INQUIRE is funded by the European Union (GA 101058518)*".