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Tremor analysis on dense network using Distributed Fiber Optic Sensing at La Palma

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The fast rise of Distributed Fiber Optic Sensing (DFOS, also known as DAS) technology in seismology has enabled to reach new horizons in volcano monitoring for example by its ability to attain hardly accessible environment and its high spatial and temporal resolution. Such advantages are extremely valuable for observatories located on islands where the ocean complicates the installation of traditional seismic networks and would require deploying ocean bottom seismometers.

In this research, we bring DFOS to a well-studied eruption that occurred in 2021 at La Palma (Canary Islands) by using a dark fiber, an unused telecom optic fiber, joining the islands together. The cable was interrogated using an HDAS (from Aragon Photonics) operated by INVOLCAN producing a 50 km-long array reaching outward from the island in the sea.

By using a combination of traditional seismic preprocessing and array detection methods such as CovSeisNet¹, we recover low frequency signals across the entire fiber. These steps enable us to detect and locate episodes of tremor linked to the volcanic activity which we compare with complementary observables.

¹ <https://covseisnet.gricad-pages.univ-grenoble-alpes.fr/covseisnet/>