HDAS (High-Fidelity Distributed Acoustic Sensing) as a monitoring tool during 2021 Cumbre Vieja eruption

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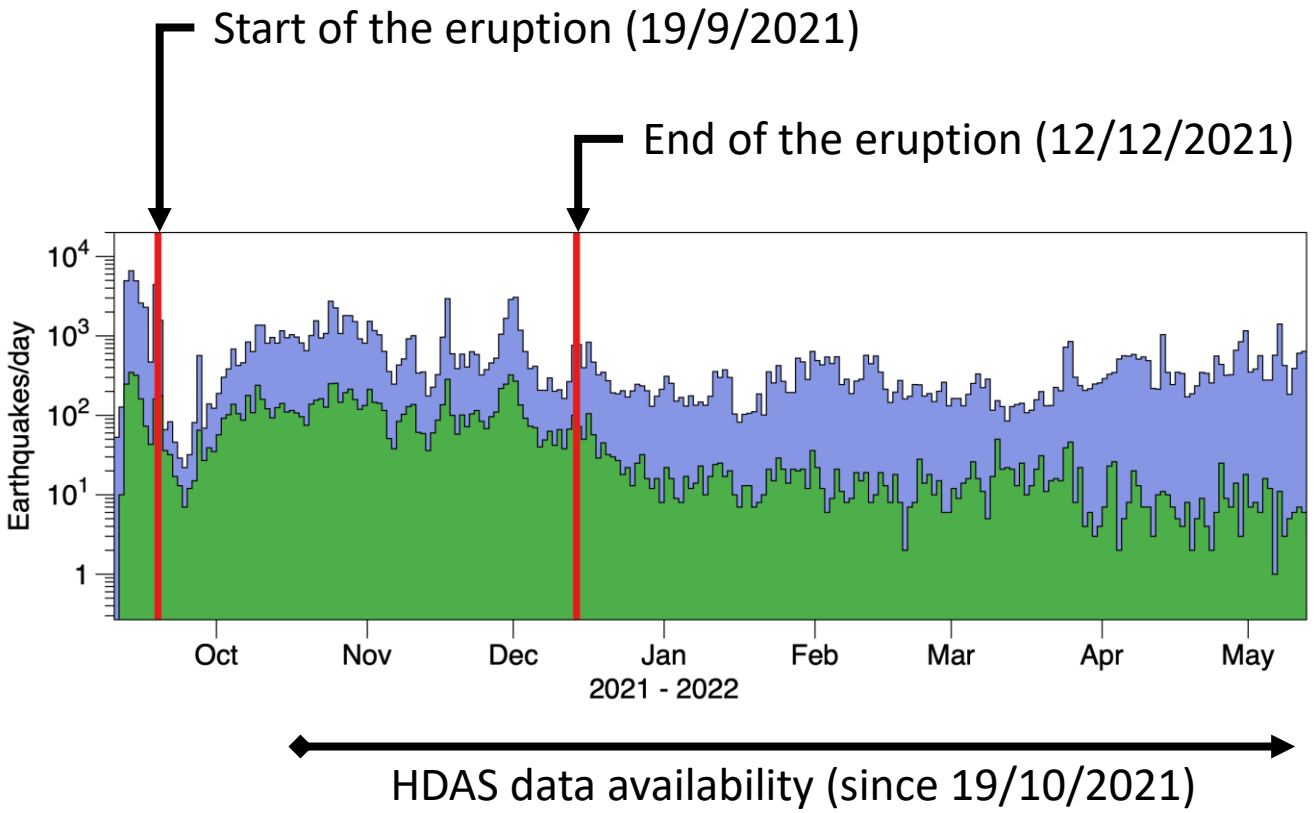
Short seismological chronology of the 2021 Cumbre Vieja eruption



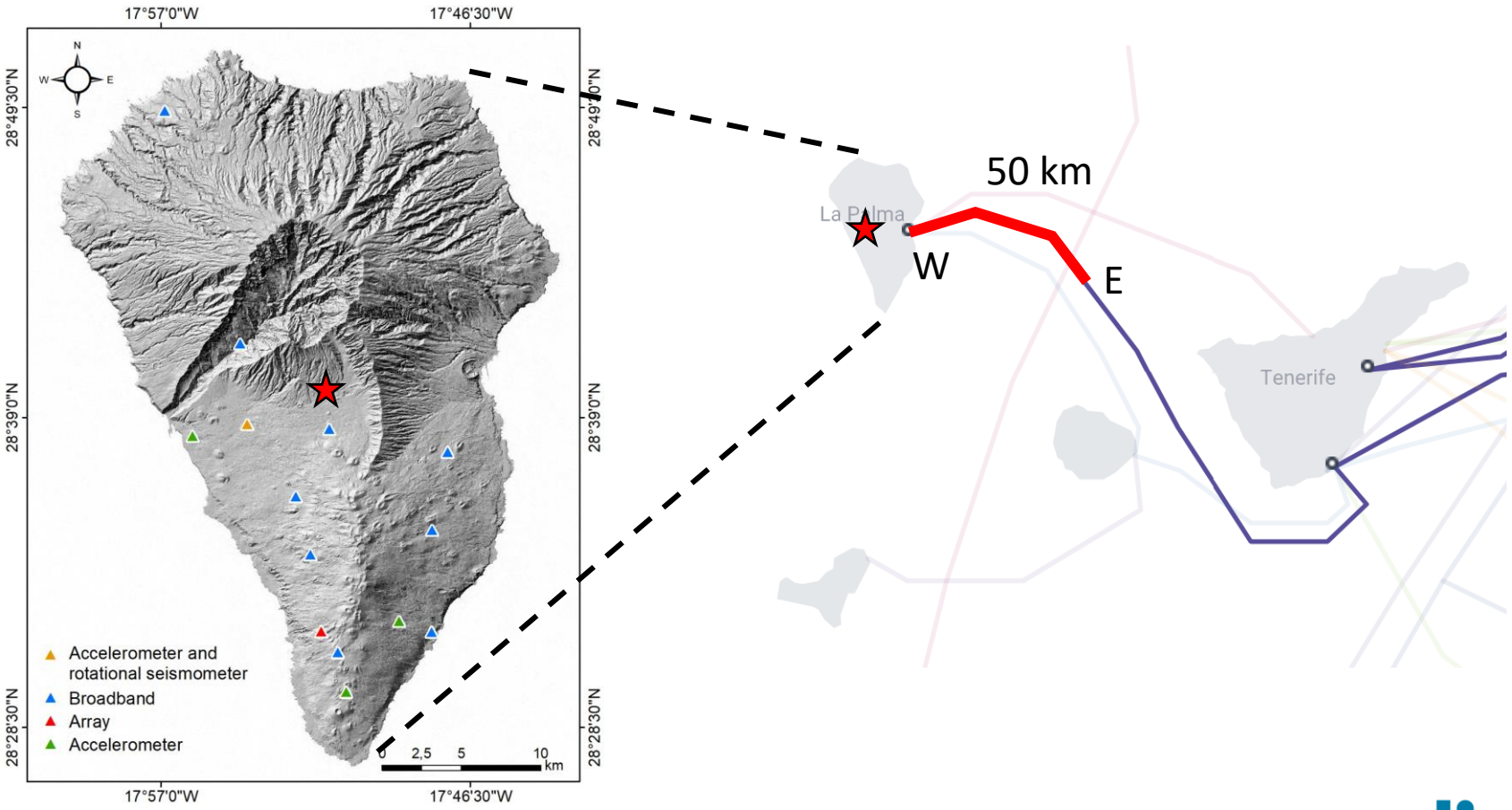
More than 140.000 **detected earthquakes** (template matching)
More than 13.000 **manually located earthquakes**

Technical specification of the HDAS

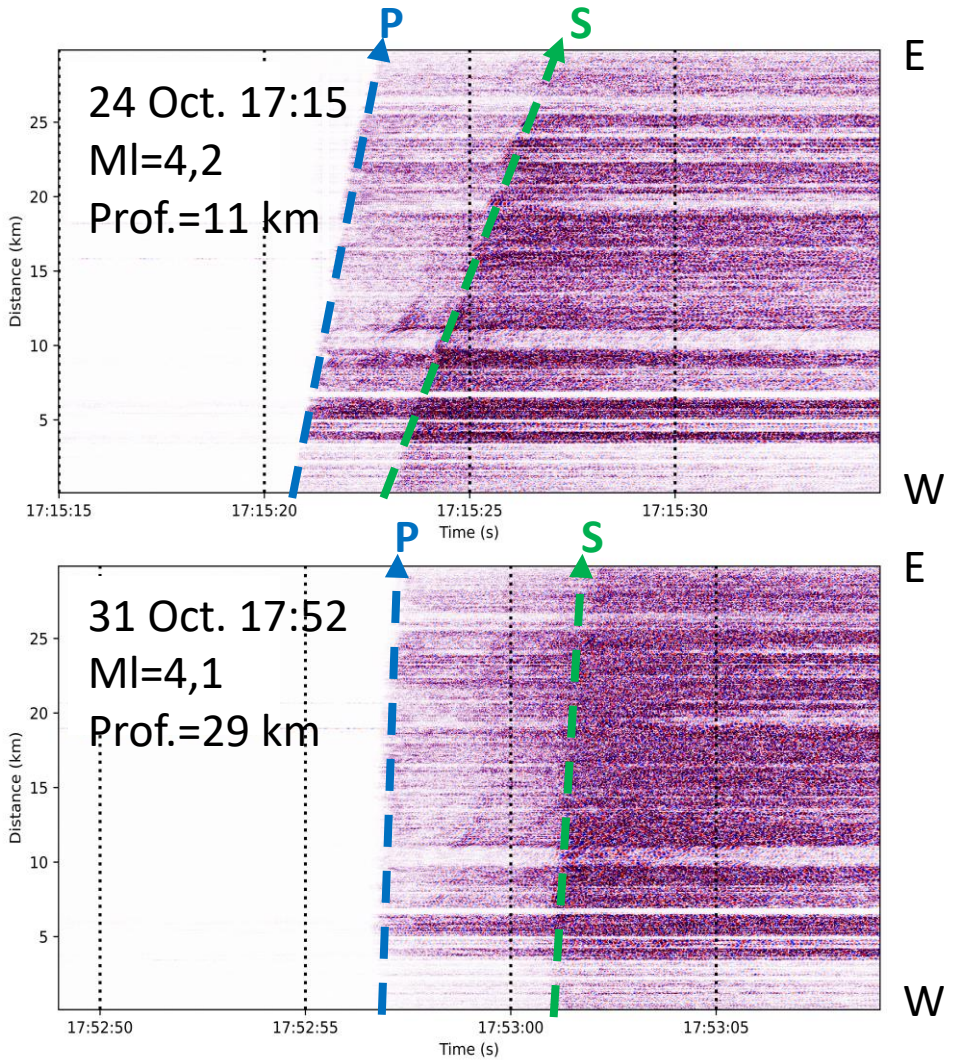
- 10 meter spatial resolution (& gauge length)
- Strain rate & relative temperature measurement
- Sampling rate: 200 Hz – 4 KHz
- Long reach up to 70 Km
- <1 nstrain sensitivity
- Remote controlled
- GPS sync

Fiber optics cable layout

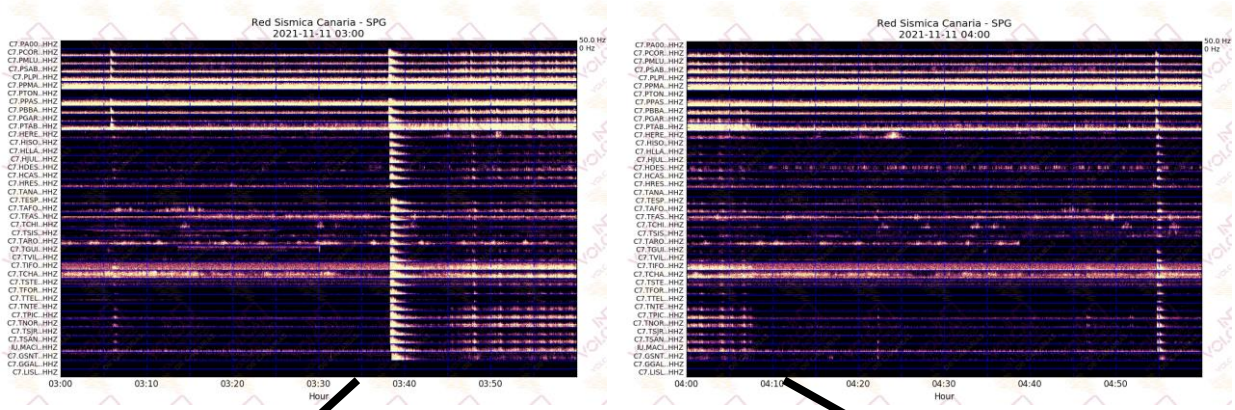
Red Sísmica Canaria (C7) in La Palma

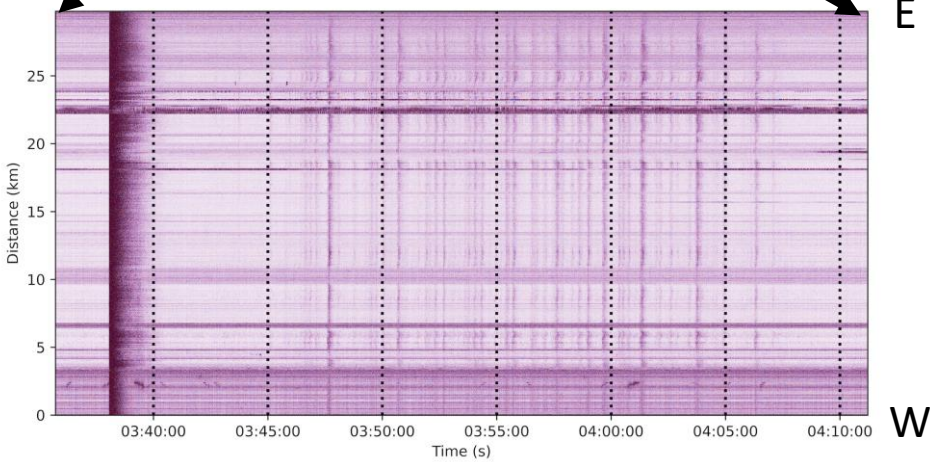


Example recordings: local earthquakes

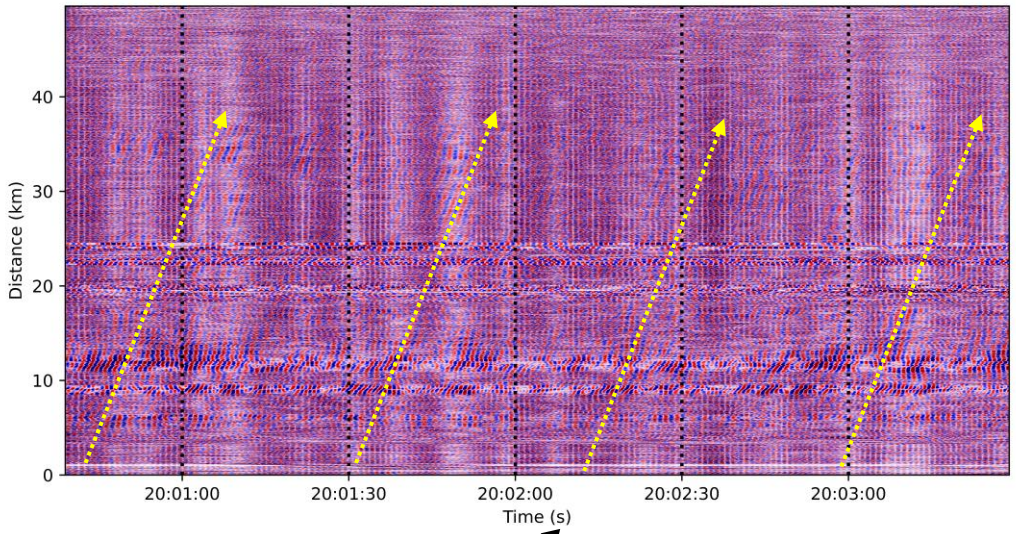


Example recordings: deep seismic swarms





Example recordings: volcanic tremor



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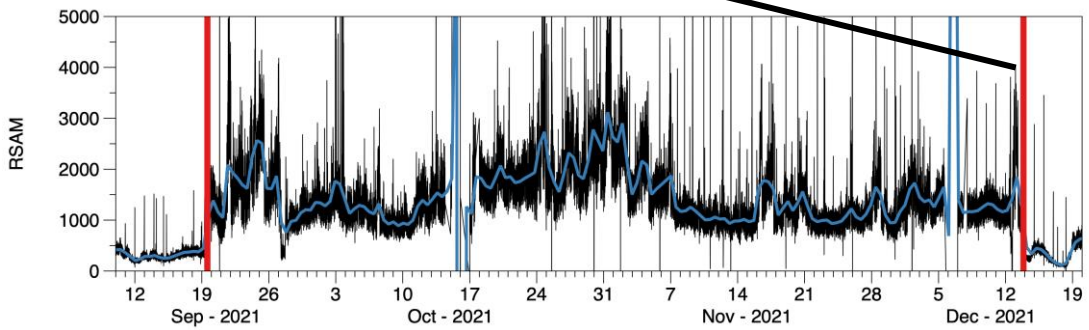

Volcanic tremor amplitude (0.4-0.6 Hz)

Ongoing activities

- About **32 TB** of data recorded until now.
- Automated detection based on **template matching**.
- Relative earthquake location using **double-pair double-difference** algorithm.
- **Array beamforming** for tracking changes in the volcanic tremor source location.
- Constraining **focal mechanisms** of earthquake families.

Lessons learned

- Distributed Acoustic Sensing can provide a very useful tool for the seismological monitoring of volcanic islands (and not only).

- It can provide valuable information in near-real-time to aid the decision-making process during volcanic emergencies.

- Specific software tools, relevant to volcano seismology, need to be developed to exploit DAS data streaming in real-time.


THANK YOU VERY MUCH
FOR YOUR ATTENTION
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