Monitoring volcanic and seismic activity with multiple fibre-optic Distributed Accoustic sensing units at Etna volcano

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Objectives

- Test ability of multiple iDAS interrogators deployed at the same time
- Increase localisation of earthquake sources
- Define protocol for data processing of multi DAS arrays
- Monitor volcano-tectonic interaction at Etna from summit to seafloor

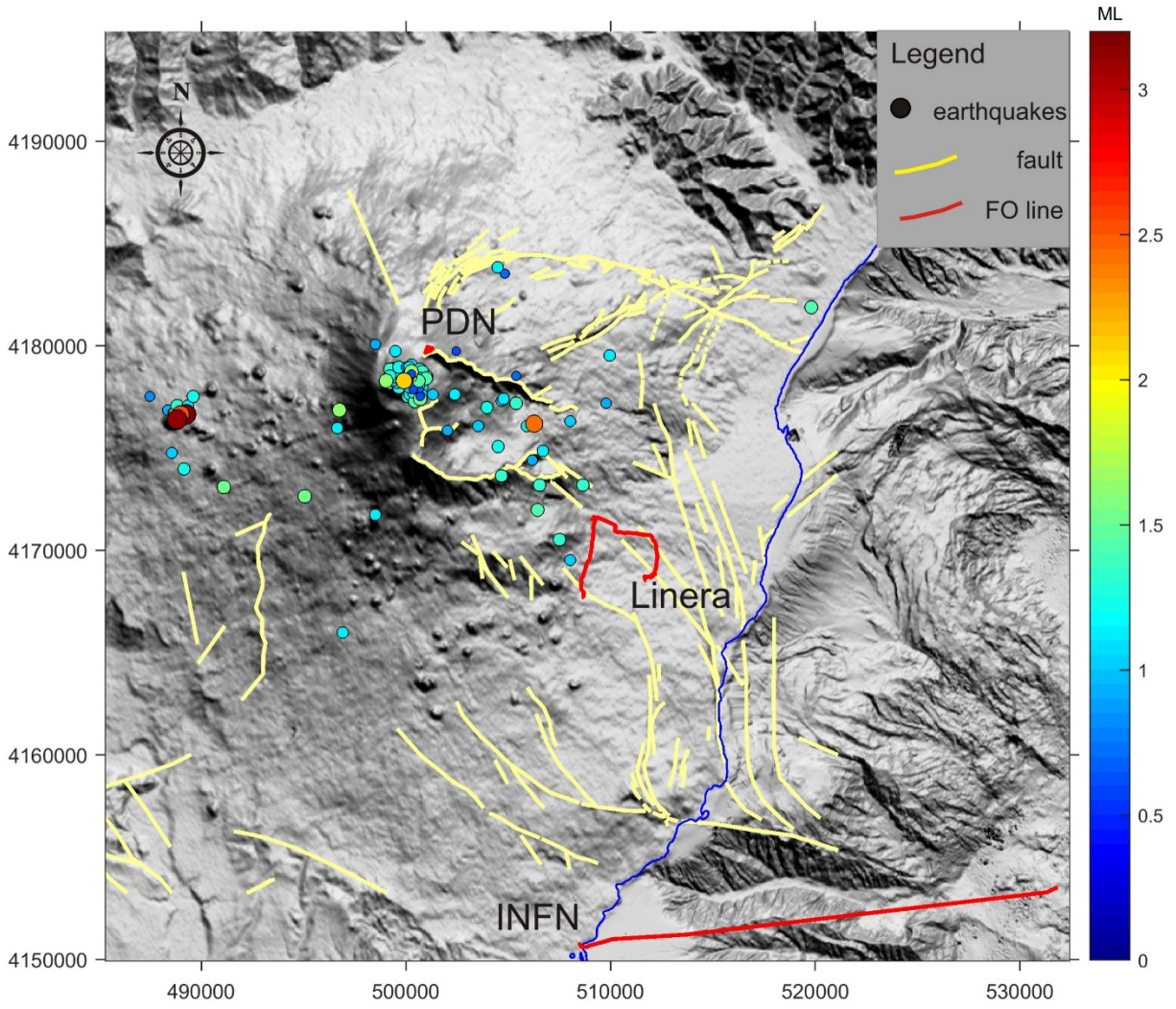
Simultaneous records of 3 iDAS units

PDN - Pizzi Deneri Summit array:
- self-deployed telecom cable (1.5 km)
  see displays D1625 and D1637

Linera array:
- TIM internet cable in urban areas (12 km)
  see display D1630

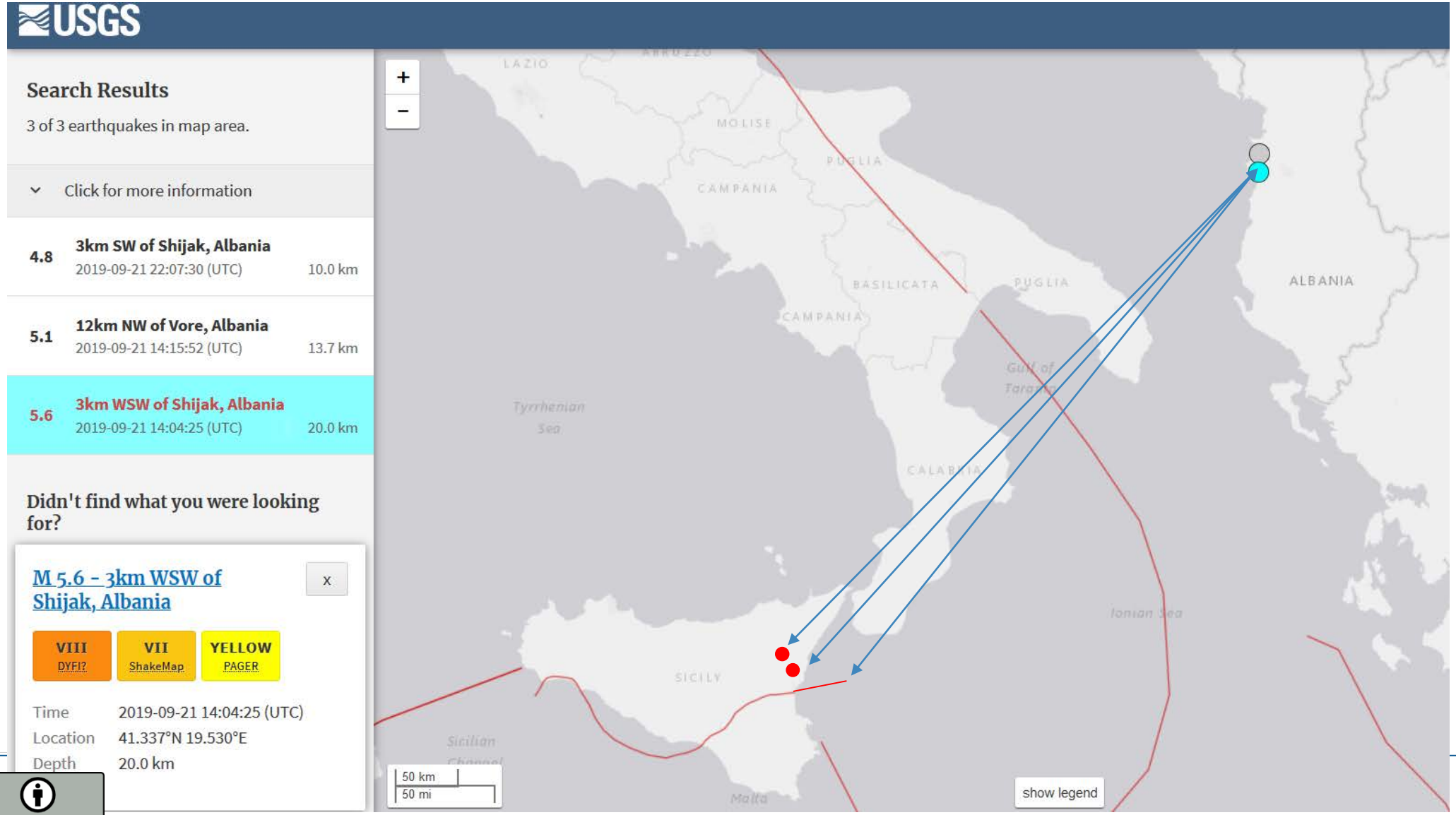
INFN-LNS array:
- Submarine Observatory (25 km)
  see display D1603

The 3 arrays were simultaneously recording from 11 to 23 September 2019, when 134 local seismic events (see map on the right) and 9 regional and teleseismic events (M>=5) occurred.



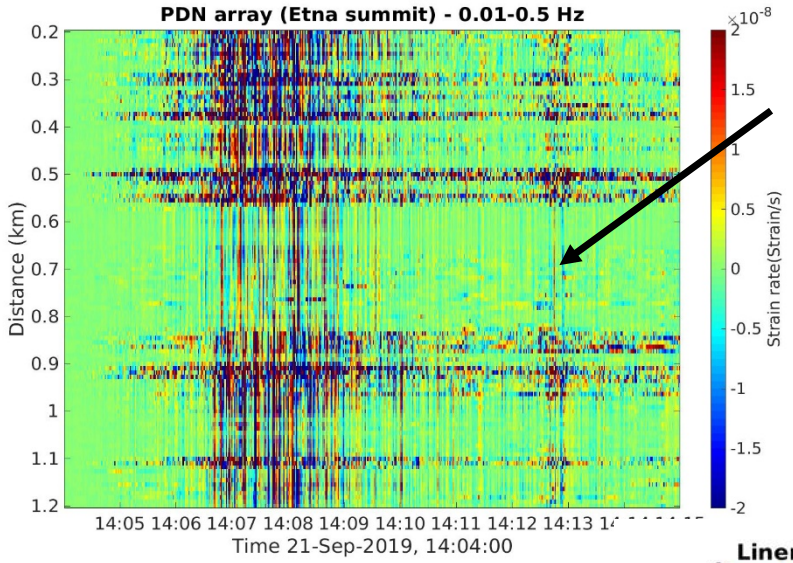
Albania, 21.09.2019

Magnitude 5.6 and 5.1



iDAS simultaneous records on 3 arrays

Downsampled (200 Hz) - strainrate

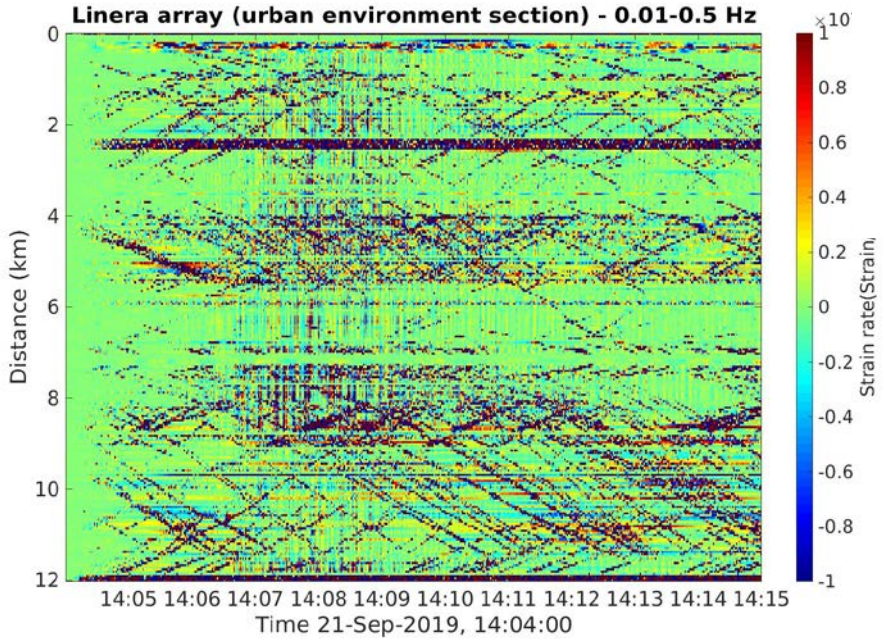


Volcanic event

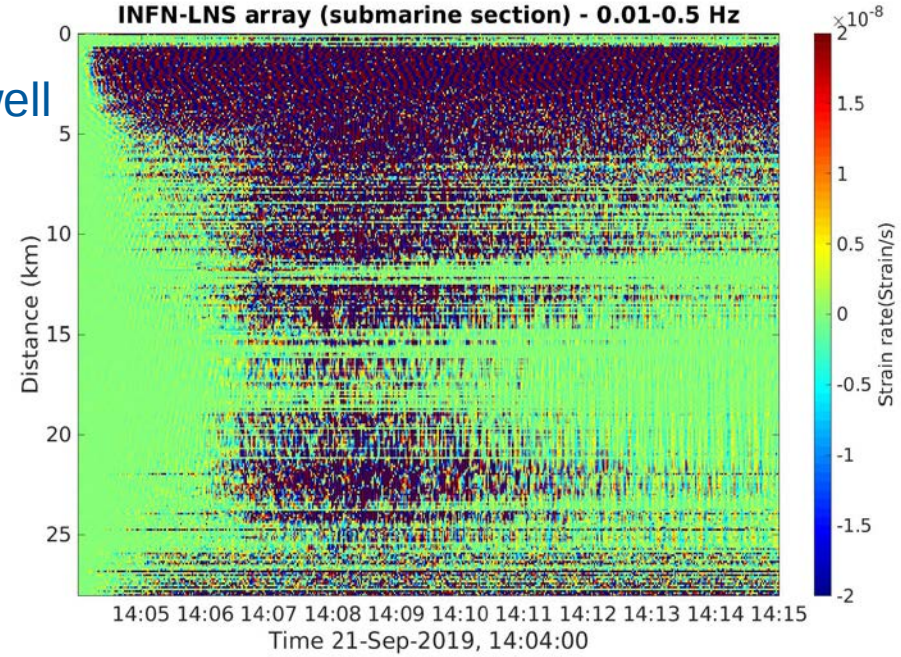
Fault zone

Earthquake

Earthquake



Swell

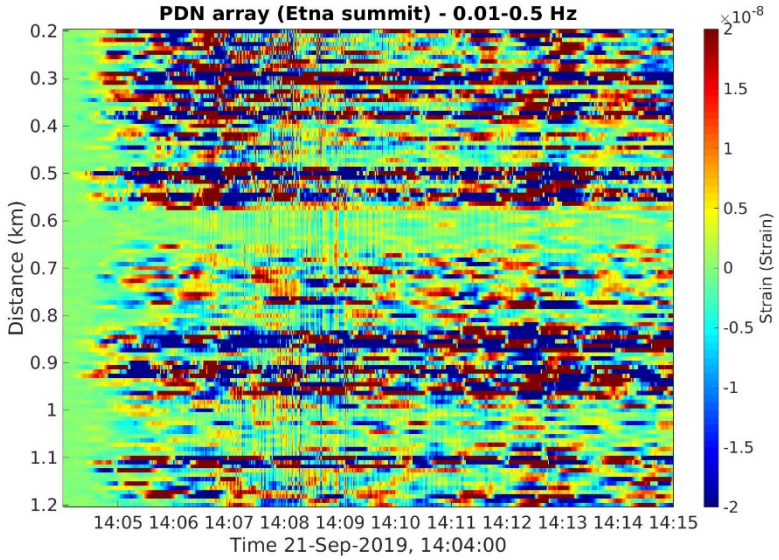


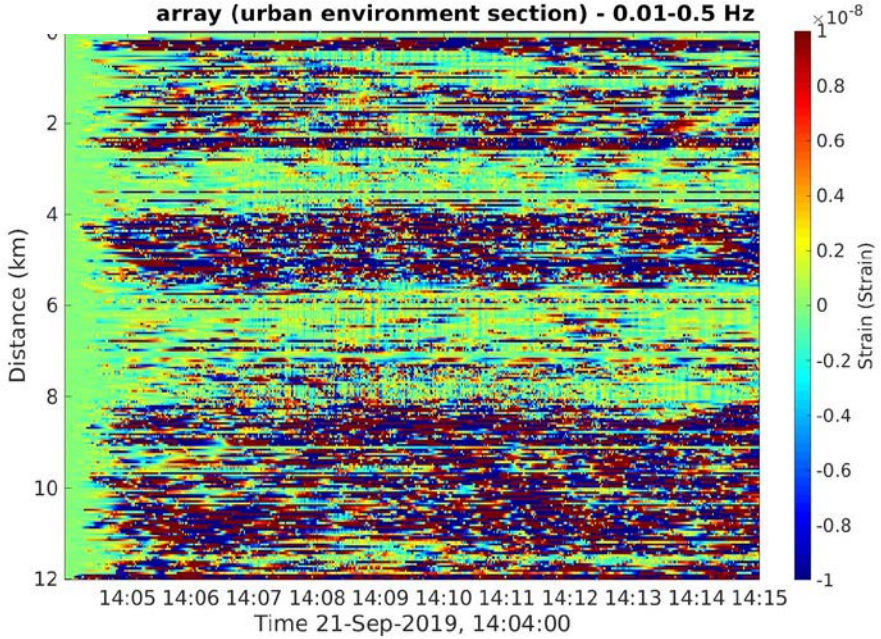
Earthquake

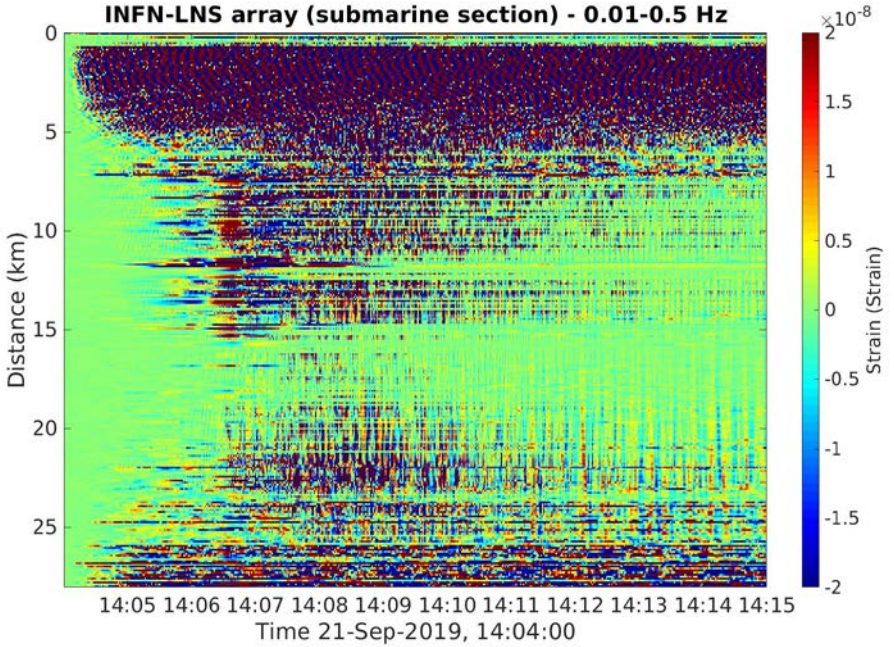
Cars

iDAS simultaneous records on 3 arrays

Downsampled (200 Hz) - strain







Conclusions and *perspectives*

Multiple iDAS interrogators deployed at the same time

- *Increase localisation of earthquake sources*
- *Extend monitoring of volcanoes by setting-up a DAS monitoring system for localising earthquakes*
- *Tomography – ambient noise, earthquake based travel time*
- *Map subsurface of the volcano*
- *Fault mapping in highly urbanized areas*

Grazie mille!