FAME: Fibre optic cables: an Alternative tool for Monitoring volcanic Events

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In the framework of EUROVOLCs Trans-national grants, we propose the FAME project aiming at validating Distributed Acoustic Sensing (DAS) technology as a complementary and alternative tool for monitoring volcanic and seismic activity at Etna volcano. DAS technology provides records of strain signals with unprecedented spatial and temporal resolution.

We deployed a fibre optic cable connected to an iDAS (Silixa) interrogator set-up at the Observatory Pizzi Deneri in the summit area. To allow for a continuously recording of the iDAS, a solar panel power system was designed using battery back-up and inverter to supply 200 W at 220 V/AC. An internet connection was set up for a full remote control capability. The iDAS interrogated a 1.5 km long fibre cable, buried at a depth of about 30 cm by digging a trench in Piano delle Concazze area. The DAS measurements were validated with conventional measurements from 26 broadband seismometers and 3 arrays of 3 infrasound sensors from the Geophysical Instrument Pool Potsdam (GIPP). We deployed instruments along the fibre optic cable, covering an area of about 0.1 km2. The DAS and conventional sensors acquired data from 4 July to 23 September 2019 without major interruptions.

Here, we show key features of this the extraordinary multidisciplinary dataset. Thanks to the high spatial resolution (2 m), we could find locations of hypothesized faults in Piano delle Concazze area. Thanks to the long acquisition period, we continuously tracked Etna activity, marked by several eruptive episodes, including ash emissions, strombolian and effusive activities from the summit craters. The most intense and sustained eruptive events occurred in 18-20 July, 27-28 July and 9-13 September. We investigate the application of well-established analysis techniques in volcano-seismology to DAS dataset in order to assess the performance of the system in detecting and characterizing volcanic events.

Our findings demonstrate that DAS technology can record on a long term basis volcanic activity, which suggests DAS technology can be integrated to volcanic monitoring systems.