GC12-FibreOptic-62, updated on 21 May 2024
https://doi.org/10.5194/egusphere-gc12-fibreoptic-62
Galileo conference: Fibre Optic Sensing in Geosciences

Secondary microseism event characterisation offshore Catania using DAS Data

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The continuous Earth ground vibrations known as microseisms that are produced by wind driven surface gravity waves dominate the seismic noise spectrum and are closely tied to storm activity. Distributed Acoustic Sensing (DAS) technology exploits the backscattering properties of fibre optic cables to acquire strain rate data which represent high-fidelity measurements of acoustic and seismic waveforms. It enables acquisition over large distances of cables acting as a densely distributed arrays for acoustic and seismic data collection on the seafloor. In particular, being sensitive to both wind waves and microseisms at the same time, DAS has shown great potential for further understanding of ocean secondary microseisms that are generated due to the head-on collision of opposing wind wave systems of same period. DAS provides new ways of studying with high resolution the microseisms' fingerprint at the seafloor and connect deep ocean microseisms events with land observations.

Here, five days of DAS data collected in October 2020 along a circa 29km long section of the fibre optic cable of the INFN-LNS subsea infrastructure, offshore Catania, Sicily in parallel to the FOCUS-ERC project was analysed to investigate the microseisms in the area. We focus on the study of a major secondary microseism event associated with high winds moving over Sicily, crossing the Mediterranean Sea from NW to SE. The spatiotemporal variations of the microseism energy are correlated with the local sea state variations in the area, confirming the influence of local weather conditions on microseisms generation. Whereas ocean wave model data highlight a dominant secondary microseism source located SE of Sicily, the F-K analysis shows that the associated seismic noise recorded with the DAS is propagating both in the landward and seaward directions, suggesting the potential presence of 3D path effects affecting the microseism wavefield. Finally, the DAS data is compared with nearby land broadband seismic stations to study its sensitivity and to assess the amount of microseism energy transmitted to land.