

EGU2020-8484

<https://doi.org/10.5194/egusphere-egu2020-8484>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



## Automatic Earthquake Detection and De-noising for Distributed Acoustic Sensing: Examples from On-land and Underwater Fibers

**Itzhak Lior**, Daniel Mata, Gauthier Guerin, Diane Rivet, Anthony Sladen, and Jean-Paul Ampuero  
Géoazur, CNRS, Observatoire de la Côte d'Azur, IRD, Université Côte d'Azur, France (lior@geoazur.unice.fr)

The use of underwater optical fibers, such as those currently traversing most of the world's oceans, for distributed acoustic sensing (DAS) holds great potential for seismic monitoring by complementing on-land seismic observations, especially near underwater faults. The analysis of underwater DAS records presents special challenges due to the noisy environment and the uneven cable-seafloor coupling. To fully exploit the potential of these records, automatically detecting and extracting seismic signals is imperative. To this end, a new automatic earthquake detection scheme is presented, based on waveform-similarity. Cross correlations between nearby records along the fiber are continuously calculated in short overlapping intervals. Earthquakes are detected as abrupt increases in cross correlation values over large segments of the cable. This procedure is applied to records of four existing fibers: one on land (Near Teil, south of France) and three underwater (one in Toulon, south of France, and two in Pylos, south-west Greece). Detected earthquakes are compared to earthquake catalogs and detection thresholds are obtained. That several of the detected earthquakes do not appear in any earthquake catalog demonstrates the proposed method's robustness. The cross correlation time shifts are then used to perform moveout corrections to the time series and phase weighted stacking (PWS) is applied to groups of neighboring traces. Unlike simple stacking approaches, PWS significantly enhances signal to noise ratios, allowing for more precise earthquake analysis and characterization. Further developing and applying such automatic techniques to ocean bottom fibers will enhance the performance of earthquake early warning systems, improving alert times for earthquakes occurring on underwater faults.