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Global Distributed Fibre Optic Sensing recordings of the February 2023 Turkey earthquake sequence.

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As part of a global distributed acoustic sensing (DAS) campaign, multiple DAS interrogators (from academia and industry) recorded simultaneously from 1st till 28th February 2023 in different regions of the globe. The objective is to define if and how a global monitoring system based on DAS could perform for teleseismic event record and analysis. Each participant uploaded triggered data window from earthquakes with magnitude larger than 5, as defined by global seismological networks, to a central storage location. Data was pre-processed following common filtering parameters (spatial and temporal sampling). Bottle-necks in data format, storage, and legal issues are identified and reviewed to pose the basis for a common DAS data archive strategy.

In this study, we present a selection of DAS records of the Turkey earthquake sequence, from borehole, surface, on-land, submarine telecommunication or dedicated cables all over the globe. They comprise a few kilometers long railroad track (Switzerland), an 0.8 km long deployed cable in the Limmat river, near Zürich (Switzerland), a 1 km deployed cable at Mt. Zugspitze in the Alps

(Germany/Austria), a 21 km telecom cable in the forest around Potsdam (Germany), a 17 km telecom cable surface geothermal field (north Iceland), a 0.2 km borehole at Etna volcano (Italy), a telecom cable in the city of Istanbul (Turkey), a 25 km telecom cable in Melbourne (Australia), in the inner city line in Graz (Austria), in the city of Seattle, WA (USA), a submarine cable in the North Sea, a submarine cable connecting Ny Ålesund and Longyearbyen at Svalbard (Norway), a 0.8 km dedicated fibre in a quick clay area in Norway, amongst many others.

We show that signals from the two destructive earthquakes in Turkey were recorded all over the globe. We discuss the signal quality and their potential use to study teleseism signals. We analyze recorded strain amplitudes according to the different array geometries and the differing sensitivities to wave types (body, surface waves, possibly others) and deployment conditions. When available, comparison with other sensors located in the same place is performed. Finally, we analyze the influence of local geological conditions due to the passing large amplitudes waves.

With the increasing availability, reduced cost and improved simplicity of DAS systems and the wide spread existing fibre optic networks, we believe fibre-optic sensing will play an ever-increasing role in the global seismic monitoring.

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