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## Danish earthquake recorded by distributed acoustic sensing (DAS)

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On September 16th 2018 a Danish earthquake of local magnitude 3.7 was recorded by distributed acoustic sensing (DAS) in a ~23 km long fibre-optic cable. The data are used to study how well DAS can be used as a supplement to conventional seismological data in earthquake localisation. One of the goals in this study is extracting a small subset of traces with clear P and S phases to use in an earthquake localisation, from the 11144 traces the DAS system provide. The timing in the DAS data might not be reliable, and therefore differences in arrival times of S and P are used instead of the exact arrival times.

The DAS data set is generally noisy and with a low signal-to-noise ratio (SNR). It is examined whether stacking can be used to improve SNR. The SNR varies a lot along the fibre-optic cable, and at some distances, it is so small that the traces are useless. Stacking methods for improving SNR are presented.

A field test at two location sites of the fibre-optic cable was conducted with the purpose of comparing DAS data with seismometer data. At the field sites, hammer shots were recorded by a small array of three STS-2 sensors located in a line parallel to the fibre-optic cable. The recordings generally show good consistency between the two data sets.

In addition, the field tests are used to get a better understanding of the noise sources in the DAS recording of the earthquake. There are many sources of noise in the data set. The most prominent are a line of windmills that cross the fibre-optic cable and people walking in the building where the detector is located. Also, the coupling between the fibre-optic cable and the ground varies along the cable length due to varying soil type and wrapping around the fibre-optic cable, which is also evident in field test data. Furthermore, the data from the field tests are used to calibrate the location of the fibre-optic cable, which is necessary for using the DAS data in an earthquake localisation.

Data processing is done in Matlab and SEISAN.