



Deployment recommendation for Distributed Acoustic Sensing at the surface

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Distributed Acoustic Sensing (DAS) is an optical interferometry based ground motion sensing technology which has the potential to revolutionize the field of seismological data acquisition. It offers the possibility to replace very large numbers of cost-intensive conventional point sensors (seismometers or geophones) by interrogating a single low-cost optic-fibre cable. Being unaffected by spatial aliasing, DAS is emerging as a potential next-generation broad-band geo-hazard (e.g. earthquakes, landslides) and reservoir (e.g. geothermal, oil and gas) seismic monitoring tool.

For borehole applications, with the cable appropriately coupled with the casing, the reliability and benefit of DAS-based VSP acquisition is now widely recognized. At the surface however, for reflection seismic for example, the adequate deployment procedure is less well documented, and experiments are performed with cables sometimes directly deployed on the surface, or sometimes buried quite deep (e.g. one meter) in the ground. Especially for non-permanent monitoring, the trenching effort can be substantial or unaffordable due to logistic or permitting issues. One may wonder if such an effort with its associated cost is actually beneficial.

We present here the results of a surface-based active seismic experiment conducted in Switzerland in the context of a geothermal reservoir characterization project with “co-located” stretches of cable deployed at different depths. The repeatability of the DAS measurements is quantified and compared to a dense array of conventional multi-component geophones. The study shows that deeply (50 cm) deployed cables offers only marginal data quality improvements compared to very shallow (2 cm) cables. In contrast, the parts of the cable directly laid down at the surface exhibit much larger noise levels and very poor repeatability (approximately one order of magnitude larger NRMS). Our study suggests that only a minor amount of elastic material covering the cable is enough to provide a good coupling and that a modest machine to conveniently perform such a shallow deployment would greatly benefit the growing DAS user community.