

Surface seismic for mineral exploration using Distributed Acoustic Sensing

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Distributed Acoustic Sensing (DAS) has been intensively tested in Oil and Gas sector, including several CO₂ sequestration projects. The technology is rapidly developing, creating a potential for its widespread use across resource industry. So far the use of DAS was largely confined to boreholes but this technology has potential to be implemented in the reflection mode for surface seismic investigations. This is of particular interest to the mining sector due to a potential significant saving over a conventional seismic survey. The implementation of DAS for the mining sector is much more challenging due to very complex geology and in general low reflectivity.

In this study we show first attempts to use DAS technology for the surface reflection seismic investigations rather than it is commonly attempted in boreholes. We present a series of case studies of using optic cables as seismic receivers for 2D seismic surveys for mineral exploration. The presentation shows the evolution of the deployment of the cable and shows both the advantages and shortcomings of DAS for such applications. The main advantages include: much faster deployment than traditional geophone systems resulting in big cost savings, much denser spatial sampling resulting among others to higher fold and non-aliased wavefields, superior images especially of the shallow parts of the subsurface. Some of the potential shortcomings include lack of sensitivity to waves polarised perpendicular to the fibre, which can result in very weak refracted waves and thus need to use auxiliary geophones for refraction static corrections. However, recent studies with new generation of cables showed promise that DAS may be self-sufficient in near future.