# Comparison of Amplitude Measurements on Borehole Geophone and DAS Data

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**Abstract**

A significant increase in using distributed acoustic sensing (DAS) as a main sensor of choice in borehole seismic applications prompts more fundamental research in understanding what DAS measures, the limitations and performance of the technology, and how it compares to the conventional sensors. Here we use borehole seismic data collected with conventional three-component geophone and distributed acoustic sensing to quantify and compare seismic measurements at the GeoLab facility at Curtin University campus (Perth, Western Australia). This facility allows repetition of the experiment using different sensors in controlled, stable conditions; deployment fibre cables as borehole and surface arrays; and utilisation of different types of seismic sources. In this presentation we compare the two datasets acquired with the conventional Sercel SlimWave VSP tool and Silixa iDAS v2. Data collected with geophones correspond to particle velocity measurements and can be calibrated to this velocity from native system units (mV) to m/s. By differentiating the measurements over the 10-meter interval, we get "converted geophone" data, which now has a property of the strain rate with unit [1/s]. In addition to this, DAS data which natively measure phase variation over time, can be calibrated to the absolute strain rate with units [1/s]. Although calibrated to the same property, these two datasets are impacted by different factors that could affect their amplitudes' absolute values. For example, the geophone amplitudes are affected by the type of geophone and its performance, probe's housing, the quality of the probe's coupling to the formation or the casing, etc. The DAS amplitudes are affected by cable design, the cable's coupling to the formation, optical parameters, interrogator design, etc. We use both the peak-time amplitudes and the entire wavefield to compare the absolute values of the strain rate of both types of sensors. For the given study area and survey design (local geology, type of geophone and fibre-optic cable), it appears that amplitudes of the strain rate have similar absolute values.

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