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Results of Field Testing of Simultaneous DAS and Geophone VSP

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SUMMARY

As part of a CO2 storage project at Citronelle, Alabama, VSP data was acquired with a short string of tubing-deployed, wall-locking, geophones (18 at 15 m spacing) and a long (3 km) fiber, also tubing-deployed. We will show data examples comparing geophone and DAS attributes such as spectral response, signal-to-noise ratio and ground motion sensitivity comparison.

Introduction

As part of a CO_2 storage project at Citronelle, Alabama, vertical seismic profile (VSP) data was acquired with a short string of tubing-deployed, wall-locking, geophones (18 at 15 m spacing) and with distributed acoustic sensing (DAS) using a long (3 km) fiber, also tubing-deployed. Initial testing in 2012 was followed by further tests in 2013. We will describe two field tests to investigate the characteristics of DAS using this semi-permanent deployment.

Method

The geophones and fiber were deployed as part of a multi-purpose modular borehole monitoring (MBM) scheme. The seismic source was a vibroseis truck. Both clamped geophones and DAS data were recorded simultaneously. Figure 1 shows an example of 2013 DAS VSP data from Citronelle.

Examples

We will show data examples comparing co-deployed geophone and DAS attributes such as spectral response, signal-to-noise ratio and ground motion sensitivity comparison.

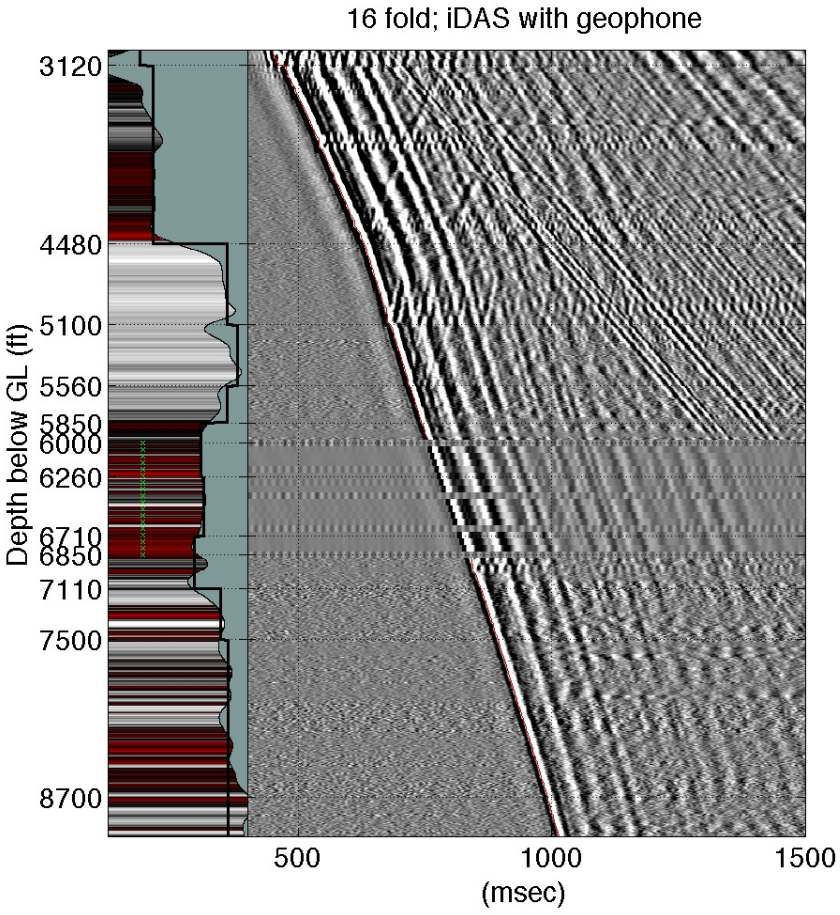

Figure 1 *This is an example of 2013 DAS VSP data acquired at Citronelle from the deepest section of the well. Data from tubing-deployed geophones between 6000-6850 ft depth is inserted (green x indicates geophone location). Shown on left side is lithology from gamma log and Vp model from DAS.*

Conclusions

Following initial tests using standard VSP acquisition in 2012, improvements in operations of the specific DAS recording unit (the iDAS), along with design of dedicated experiments, allowed greatly improved data quality in 2013 testing, even though the fiber was in a flatpack strapped to tubing.

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