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Please fill in your manuscript title.	A Comparison of Fiber Optic DAS VSP Acquired Between Cemented, Tubing and Wireline: Field Trial

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Abstract

The evolution of fiber optic cables over the past few decades has allowed for significant improvements in the fields of high-speed and long-distance communication, big data transport, optical imaging, and sensing. Few studies have surfaced detailing the use of fiber optic sensors (FOSs) as point and distributed sensors in geophysics. Distributed Acoustic Sensing (DAS) is the main sensor method to image the subsurface within the vicinity of wellbore thus allowing for detail structures and properties of the reservoir to be monitored. As a monitoring method, DAS in wells has proven to be important in Vertical Seismic Profiling (VSP) surveys. Four strategies for deploying fiber-optic sensing (FOS) cables in distributed acoustic sensing (DAS) vertical seismic profiling (VSP) are compared and evaluated: cemented behind casing, cable behind inflatable liner, strapped to production tubing, and wireline deployment. Cementing the fiber behind casing is the most effective method for coupling the sensor with the formation. Fiber cable behind inflatable liner was deployed to mimic the method of cementing the fiber behind casing as it allows for accessibility to the fiber without affecting the acoustic signal.Strapping the fiber to production tubing can still record DAS signals, but tubing noise and signal attenuation from the annular fluid can make it difficult to differentiate the seismic signal. However, this method has the benefit of being simpler to deploy and replace in case of failure. Wireline deployment can pick up some acoustic signal in regions where the cable touches the well wall, but in vertical sections where the cable is not in contact with the wall, the signal is attenuated. The paper discusses results from pilot tests in a field in Canada, compares the responses of each method, and suggests ways to improve the VSP signal.