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observations using Distributed Acoustic Sensing technology on a fiber-optic submarine cable

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A ship-based air-gun survey was conducted contemporarily with distributed acoustic sensing (DAS) observations using an abandoned submarine cable. Measurements were compared between DAS and co-located hydrophones on the seafloor. DAS measures the Rayleigh back-scattering variations along a fiber-optic cable, of the same kind as the IMS HA hydrophone stations' trunk cables, using incident laser light from the cable terminal. From this measurement, strain or strain rate are obtained. It is known that both spatially- and temporally-dense measurements are achieved with DAS technology, and therefore 50-km length DAS was performed with 10-m resolution and 500-samples per second (SPS). The submarine cable was on the seafloor, except for a 2-km buried section, and reaching 1000 m depth. Broadband frequency signals associated with the air-gun shots recorded by DAS agreed with recordings from co-located hydrophones. The amplitude of DAS strain rate is correlated to pressure at a frequency range above 2 Hz. We also investigated the capability of DAS to measure ocean microseismics (peak frequency ~0.1 Hz), which were identified along the entire submarine cable up to 50 km. Since DAS is performed along a fiber-optic cable of several tens of kilometers length, it can be used also for array observations.

Promotional text

Hydroacoustic observations of air-gun shots by distributed acoustic sensing (DAS) using a fiber-optic submarine cable, and comparison with data from co-located hydrophones, show that DAS can detect hydroacoustic signals. Our data suggests DAS can be used for array observations.

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