Dark fiber for rapid aftershock response:
Capturing the 2022 M6.4 Ferndale sequence in northern California

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Three days after the 2022/12/20 M6.4 earthquake near the Mendocino triple junction, we deployed a distributed acoustic sensing (DAS) system on ~15 km of dark telecommunications fiber within 50 km of the mainshock epicenter, sampling at 250 Hz every 2 m, and applied a real-time automated earthquake detection system. The detection algorithm estimates coherent array energy and adapts to environmental noise levels; spatial filtering suppresses environmental noise and emphasizes local earthquake signatures. With this system we identified ~5 times the number of earthquakes as in a comprehensive regional catalog (with Mc ~1.9), up to M5.4 (the largest aftershock), and detections are consistent with an independent deep-learning-enhanced catalog based on seismometer data alone. On-site computing provides rapid processing and real-time notification: average latencies for processing 1-second-long time windows with 50% overlap were <0.6 seconds. Additionally, we deployed nodal seismometers every ~350 m along the DAS array to constrain local ground motions and site conditions. Amplitudes vary strongly along the cable due to a combination of wavefield and site effects, but vary systematically for both P and S waves, and waveform clipping is not observed. Thus, we developed linear site corrections and calculate local earthquake magnitudes DAS strains. In general, the magnitude accuracies are comparable to regional network estimates, and we are evaluating the ability of these DAS data to accurately recover apparent source time functions from empirical Green's function deconvolutions.