

Dynamic strain determination using fibre-optic cables allows imaging of seismological and structural features

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Natural hazard prediction and efficient crust exploration require dense seismic observations both in time and space. Seismological techniques provide ground-motion data, whose accuracy depends on sensor characteristics and spatial distribution. Here we demonstrate that dynamic strain determination is possible with conventional fibre-optic cables deployed for telecommunication. Extending recently distributed acoustic sensing (DAS) studies, we present high resolution spatially un-aliased broadband strain data. We recorded seismic signals from natural and man-made sources with 4-m spacing along a 15-km-long fibre-optic cable layout on Reykjanes Peninsula, SW-Iceland. We identify with unprecedented resolution structural features such as normal faults and volcanic dykes in the Reykjanes Oblique Rift, allowing us to infer new dynamic fault processes. Conventional seismometer recordings, acquired simultaneously, validate the spectral amplitude DAS response between 0.1 and 100 Hz bandwidth. We suggest that the networks of fibre-optic telecommunication lines worldwide could be used as seismometers opening a new window for Earth hazard assessment and exploration.