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Passive seismic velocity monitoring of natural faults: The FaultScan project

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Laboratory experiments report that detectable seismic velocity changes should occur in the vicinity of fault zones prior to earthquakes. However, operating permanent active seismic sources to monitor natural faults at seismogenic depth has been nearly impossible to achieve. The FaultScan project (Univ. Grenoble Alpes, Univ. Cal. San Diego, Univ. South. Cal.) aims at leveraging permanent cultural sources of ambient seismic noise to continuously probe fault zones at a few kilometers depth with seismic interferometry. Results of an exploratory seismic experiment in Southern California demonstrate that correlations of train-generated seismic signals allow daily reconstruction of direct P body-waves probing the San Jacinto Fault down to 4 km depth. In order to study long-term earthquake preparation processes we will monitor the San Jacinto Fault using such approach for at least two years by deploying dense seismic arrays in the San Jacinto Fault region. The outcome of this project may facilitate monitoring the entire San Andreas Fault system using the railway and highway network of California. We acknowledge support from the European Research Council under grant No.~817803, FAULTSCAN.