Fracture imaging using DAS-recorded microseismic events

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Abstract

Hydraulic fracturing enables hydrocarbon production from unconventional reservoirs. Mapping induced seismicity around newly created fractures is crucial for understanding the reservoir response and increasing the efficiency of operations. Distributed acoustic sensing (DAS) provides a large amount of high spatial resolution microseismic data acquired along the entire length of horizontal wells. We focus on the observed reflected S-waves and develop a new methodology to image induced fractures acting as reflectors in the media surrounding the events and monitoring fiber. The workflow consists of DAS data preprocessing, event location, wavefield separation, raytracing-based imaging, and image postprocessing. The comparison of the resulting fracture images with low-frequency DAS signals with fracture hits corroborates that the reflections are from fractures created by stimulation. The fracture imaging algorithm can be used for real-time mapping of fractures and tracking fracture changes in time. It leads to a better understanding of the reservoir response to hydraulic fracturing stimulation.

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Key points:

1. Mapping fractures and understanding the reservoir response are the main goals of microseismic monitoring during hydraulic fracturing.
2. Distributed Acoustic Sensing provides high spatial resolution of microseismic reflections data.
3. The proposed fracture imaging workflow uses reflected shear waves in the time-space domain to map induced fractures in space domain.