

Towards Detection of Hydraulic Fracturing Induced Earthquakes Using Neural Network

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Detection, location and determination of focal mechanism of low frequency and hybrid events such as volcanic and non-volcanic events have been extensively studied. Recently, Das and Zoback (2011) found unusual events which has relatively low frequency in the seismic activity induced during hydraulic fracturing in a gas shale reservoir. Those events were observed in limited frequency band similar to tectonic tremor sequences. It is important to understand the mechanisms of those events for clarifying the fracturing process during the hydraulic stimulation. In this study, we introduce a method to detect the band-limited waveform using neural network. The results of the initial numerical test indicate that the harmonic function waveforms could be identified when they have clear features in shape. As the next step, we will add realistic noise to the synthetic data and perform the synthetic analyses. After we verify the applicability of our method, we will apply the method to real seismic data observed during fluid injection.

Keywords: Neural Network, Waveform detection, Hydraulic fracturing, Low frequency earthquake, Seismic Waveform