



Robust Hydraulic Fracture Monitoring (HFM) of Multiple Time Overlapping Events Using a Generalized Discrete Radon Transform

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In this work we propose a novel algorithm for multiple-event localization for Hydraulic Fracture Monitoring (HFM) through the exploitation of the sparsity of the observed seismic signal when represented in a basis consisting of space time propagators. We provide explicit construction of these propagators using a forward model for wave propagation which depends non-linearly on the problem parameters - the unknown source location and mechanism of fracture, time and extent of event, and the locations of the receivers. Under fairly general assumptions and an appropriate discretization of these parameters we first build an over-complete dictionary of generalized Radon propagators and assume that the data is well represented as a linear superposition of these propagators. Exploiting this structure we propose sparsity penalized algorithms and workflow for super-resolution extraction of time overlapping multiple seismic events from single well data.

Subjects: **Geophysics (physics.geo-ph)**; Information Theory (cs.IT); Applications (stat.AP)

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