Geophysical Research Abstracts
Vol. 15, EGU2013-11971, 2013
EGU General Assembly 2013

Multi source- multi receiver processing for arrival time optimization of microseismic borehole array data

Joern Kummerow
Freie Universitaet Berlin, Geophysics, Berlin, Germany (joern@geophysik.fu-berlin.de)

Together with a realistic velocity model and a well-designed seismic monitoring system, the quality of arrival time measurements is one of the most important factors to limit the uncertainty in the earthquake location problem. The accuracy of time picks is generally increased by exloiting the waveform similarity. This allows to calculate more precise differential arrival times which replace or improve the original arrival time picks. Typically, the waveform data are processed either event-based or receiver-based.
Here, we propose to combine the receiver- oriented and the event- oriented approaches to optimize simultaneously arrival time picks for micro seismic events recorded by multi-level borehole arrays. The method extends existing concepts by cross-linking waveforms of different events in a multiplet recorded by closely spaced receivers, and the increased interconnectivity of waveforms also increases the consistency of the arrival time data. We apply the method to a hydraulic fracturing experiment, where micro seismic data were recorded by two inclined borehole arrays consisting of 30 receivers. It is shown that the picking accuracy is significantly improved compared to the original picks and also compared to the adjusted picks obtained from single receiver based processing. We also compare the improved event relocations with the original locations.