



Application of a Waveform Similarity- Based Location Algorithm to the Basel 1 Microseismic Data

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The stimulation of the Basel 1 well at the Deep Heat Mining Project in Basel, Switzerland, was accompanied by the occurrence of a high rate of micro seismic activity. Magnitudes of the largest events exceeded the value of $M_L > 3$, which finally led to the suspension of the project. We analyzed 2834 micro seismic events with magnitudes $-1 \leq M_L \leq 3.4$. They were recorded by a downhole seismic monitoring system in a six month time period which covers both the stimulation phase from December 02 to December 09, 2006, and the post-injection phase until June 07, 2007. Here, we present a location work-flow to determine high- resolution hypocenters. New P and S wave arrival times for 2834 events recorded by six downhole geophones were determined by an iterative optimization procedure. 2138 events could be located reliably with an average *rms* misfit of only 3 ms and minimum 8 arrival time measurements. We further refined the locations of multiplet events by applying a recently introduced location algorithm which uses a combination of arrival times and cross correlation values. It is shown that for the largest multiplet consisting of 109 events, the width of the seismically active streak is of the order of 20 m. The high-precision locations are a precondition for using the micro seismicity to image the fine-scale structure of the Basel reservoir and for analyzing in detail the spatial-temporal distribution of the Basel 1 micro seismic data, in particular of the multiplet events.