Improved P-phase onset time picking for small magnitude events in passive microseismic data using Dynamic Amplitude Scaling

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Passive Seismic data is being increasingly used in exploration seismology. Considering the large size of passive seismic data many automatic algorithms have been formulated to locate the seismic events, which have been proved successful to a great extent. However, accurate picking P-phase arrival time in case of small magnitude seismic events is a challenging task, because of their lower amplitude ratio with the background noise.

Here, we propose an algorithm to improve the picking of P-phase arrival times in waveforms recorded from small magnitude seismic events. We introduce a novel pre-processing algorithm called Dynamic Amplitude Scaling(DAS) which manipulates the signal in such a way that the more accurate picking of P-phase becomes possible. The waveform is multiplied by a scaling factor which varies with time. DAS results in the increased weighting of higher amplitude components in the signal, which is related to the seismic events while suppressing lower amplitudes associated with background noise. We found that automatic phase picking algorithms yield superior results on data pre-processed using DAS when compared to raw data. We verified our algorithm on data and compared our results with the widely used and accepted automatic picking algorithm of STA/LTA triggering.