



# Method for Identifying Micro-seismic *P*-Arrival by Time-frequency Analysis Using Intrinsic Time-Scale Decomposition

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## Abstract

A method to identify the *P*-arrival of microseismic signals is proposed in this work, based on the algorithm of intrinsic timescale decomposition (ITD). Using the results of ITD decomposition of observed data, information of instantaneous amplitude and frequency can be determined. The improved ratio function of short-time average over long-time average and the information of instantaneous frequency are applied to the time-frequency-energy denoised signal for picking the *P*-arrival of the microseismic signal. We compared the proposed method with the wavelet transform method based on the denoised signal resulting from the best basis wavelet packet transform and the single-scale reconstruction of the wavelet transform. The comparison results showed that the new method is more effective and reliable for identifying *P*-arrivals of microseismic signals.

**Key words:** micro-earthquake, *P*-arrival, ITD, time-frequency analysis, denoising.