Seismic event identification using scanning detection: a comparison of denoising and classification methods

Rowe, C.A., J.K. MacCarthy, F. Giudicepietro, S. Scarpetta, S. Taylor

Automatic detection and classification methods are increasingly important in observatory operations, as the volume and rate of incoming data exceed the capacity of human analysis staff to process the data in near-real-time. We explore the success of scanning detection for similar event identification in a variety of seismic waveform catalogs. Several waveform pre-processing methods are applied to previously recorded events which are scanned through triggered and continuous waveform catalogs to determine the success and false alarm rate for detections of repeating signals. Pre-processing approaches include adaptive, cross-coherency filtering, adaptive, auto-associative neural network filtering, discrete wavelet package decomposition and linear predictive coding as well as suites of standard bandpass filters.

Classification / detection methods for the various pre-processed signals are applied to investigate the robustness of the individual and combined approaches. The classifiers as applied to the processed waveforms include dendrogram-based clustering and neural network classifiers.
We will present findings for the various combinations of methods as applied to tectonic earthquakes, mine blasts and volcanic seismicity.