

Aftershocks with Waveform Cross-Correlation

For the International Monitoring System (IMS) it is difficult to find low-magnitude aftershocks of small underground nuclear tests using only standard detection and phase association methods. At the same time, signals from thousands of aftershocks per day following Mw8+ earthquakes are difficult to separate, and thus, to recover the whole sequence. Both tasks are important for the International Data Centre (IDC) of the Comprehensive Nuclear-Test-Ban Organization. The underlying problems can be better solved with waveform cross correlation (WCC), which is most suitable for repeating events. The WCC method can reduce detection threshold and enhance phase association fully utilizing the similarity of waveforms generated spatially close seismic events. In addition, the use of WCC at seismic arrays of the IMS can reduce station-specific detection thresholds, allow accurate estimate of signal attributes, including relative magnitude, and effectively suppress irrelevant arrivals. Here, we test an aftershock tool matching IDC requirements for seismic events. It includes creation of waveform templates for master-events, cross correlation (CC) of real-time waveforms with these templates, association of arrivals detected at CC-traces in event hypotheses; building events matching the IDC event definition criteria; and resolution of conflicts between events hypotheses created by neighboring master-events.

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