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Global Grid of Master Events for Waveform Cross Correlation: Design and Testing

Seismic monitoring of the Comprehensive Nuclear-Test-Ban Treaty requires a uniform coverage of the earth. The global use of waveform cross correlation for monitoring purposes is hindered by the absence of master events outside the zones of seismic activity. To populate the aseismic areas we have studied two principal approaches. Around the seismically active areas, we replicate real events best representing seismicity in a given region and distribute them over a regular grid to distances ~1000 km. These replicated events are called "grand masters". For remote aseismic areas, we calculate synthetic seismograms for a regular grid of master events and a predefined set of array stations of the International Monitoring System. Both approaches were tested and showed a resolution similar to the use of real events. Considering three types of master events, we have created a regular and uniform grid with approximately 100 km spacing between nodes as obtained from the equilibrium distribution of charged particles over the earth's surface. We have created three versions of the grid: v0.1 with only synthetic templates, v0.2 with real masters added where possible, and v0.3 with grand masters added. The performance of v0.1 has been assessed.

Primary author: KITOV, Ivan (CTBTO)

Presenter: KITOV, Ivan (CTBTO)

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