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Extending Waveform Correlation Techniques to Broad Regional Monitoring Using IMS Data

Waveform correlation techniques are of great interest for nuclear explosion monitoring because they provide a robust means to significantly lower detection thresholds while maintaining acceptably low false alarm rates. In previous work, using our research group's distributed computing system, we have demonstrated the ability to monitor 3 years of seismicity in central Asia using our waveform correlation detector processing continuous data from the array MKAR. In the work presented here, we extend our processing to include multiple IMS stations processed together and show results for processing 3+ years of data from multiple IMS stations with a combined set of master events numbering in the thousands. Optimal detection thresholds for each template are determined using Schaff's (2010) time reversal methodology to establish a null distribution and allow selection of a threshold for a desired false alarm rate. To establish the completeness of our catalog, we compare our output event lists against the IDC LEB as well as regional catalogs from central Asia. We present our results along with discussion of the practical aspects of engineering a robust correlation system, including automatic template library creation, multi-station integration, and computational requirements.

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