ID: Type: **Oral**

3.3-O6. Searchlight Correlation Detectors: Optimal Seismic Monitoring Using Regional and Global Networks

The sensitivity of correlation detectors increases greatly when the outputs from multiple seismic traces are considered. For single-array monitoring, a zero-offset stack of individual correlation traces will provide significant noise suppression and enhanced sensitivity for a region surrounding the master event hypocenter. This region's extent is limited only by the decrease in waveform similarity with increasing hypocenter separation. When using a regional or global network, the zero-offset approach is only optimal when the master and detected events are co-located exactly. In many monitoring situations, events may be separated by up to many hundreds of meters while retaining sufficient waveform similarity for single-channel correlation detection. However, traveltime differences resulting from the hypocenter separation may result in significant beam loss on the zero-offset stack and a deployment of many beams for different hypothetical source locations in geographical space is required. The beam deployment necessary for optimal performance of the correlation detectors is determined by an empirical network response function which is most easily evaluated using the auto-correlation functions of the waveform templates from the master event. The correlation detector beam deployments for providing optimal network sensitivity for the North Korea nuclear test site are demonstrated for both regional and teleseismic monitoring configurations.

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Track Classification: 3. Advances in sensors, networks and processing