ID: Type: **Oral**

Optimizing Infrasound PMCC Detection Using Maximum Likelihood and Receiver Operating Characteristic Curve Analysis

We develop methods to determine the optimal detection thresholds for the Progressive Multi-Channel Correlation Algorithm (PMCC) used by the International Data Centre (IDC) to perform infrasound station level event detection. Statistical detection theory is used with synthetic data and real ground truth data to determine optimal individual delta time consistency detection thresholds and the "family" size threshold of grouped detection "pixels" with similar signal attributes (i.e. trace velocity, azimuth, time, and frequency). We vary the consistency threshold and present a trade-off between the probability of detection and the false alarm rate by way of Receiver Operating Characteristic (ROC) curve analysis. Further, a maximum likelihood approach is used to determine the optimal family size threshold before the detection should be considered for further processing. Optimal family sizes are determined based upon the consistency threshold, filter configuration, and Bayes cost criteria. Finally, we generate synthetic signals for particular array configurations, adjust the signal to noise ratio (SNR) to determine the SNR failure levels for the PMCC detection algorithm, and compare similar configurations to fielded infrasound station performance. For the fielded stations studied PMCC was able to detect signals with post-filtered SNRs greater than 2 dB.

Primary author: LOUTHAIN, James (Air Force Institute of Technology)

Presenter: LOUTHAIN, James (Air Force Institute of Technology)

Track Classification: Theme 3: Advances in Sensors, Networks and Processing