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Towards a Coherence Model for Infrasound Signals Recorded at International Monitoring System Arrays

The majority of detection algorithms employed to identify signals within infrasound array data (e.g., Fisher-statistic detector, Progressive Multi-Channel Correlation) rely on the signal being coherent, or correlated, across the microbarographs within the array. The signal coherence allows the detector to distinguish signal from incoherent noise. Therefore, in order to optimize signal detection algorithms and to advise on the design of new arrays, it is important to understand both the correlation structure of signals as they propagate across the array and any correlation structure of the ambient noise field. Here, we take preliminary steps towards developing a model of the signal coherence loss in the 0.02 to 4Hz frequency bandwidth that is of interest to the Nuclear-Test-Ban verification community. For over ten years operational International Monitoring System infrasound arrays have recorded signals from a wide range of sources which have associated ground truth parameters. We use a subset of these signals to assess infrasound signal coherence structure, and how this is dependent upon the signal-to-noise ratio, the array configuration, the source-to-receiver distance, and the source characteristics.

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