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T3.3-P20. Melcepstral Coefficients Used as Input to a Neural Network for Identification of an Expanded Set of Atmospheric Nuclear Explosions and Bolides

In our previous research, Melcepstral coefficients were extracted from a number of infrasonic hand-digitized atmospheric explosion waveforms from the 1962 Operation Dominic series of atmospheric nuclear tests. These explosions were shown to have a distinctive pattern of melcepstral coefficients which can be modeled with synthetically-generated waveforms. In this follow-on research, the authors have accomplished two major additions: the first being the expansion of the database to include additional atmospheric nuclear explosions, and a significant number of additional Bolides, as well as a number of surface chemical explosions. More importantly, we have designed a Neural Network that takes these coefficients and outputs the class that best fits (explosions or bolides). Finally, we have done a preliminary investigation on how the melcepstrum/neural network identifies underground nuclear and chemical explosions which are detected by one, or more, infrasound arrays, as compared with earthquakes.

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