Characterizing noise in the global nuclear weapon monitoring system

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Under the auspices of the Comprehensive Nuclear-Test-Ban Treaty Organization, a worldwide monitoring system designed to detect the illegal testing of nuclear weaponry has been under construction since 1999. The International Monitoring System is composed of a range of sensors, including detectors for hydroacoustic and seismic signals, and when completed, will include 60 infrasound measurement arrays set to detect low-frequency sound waves produced by an atmospheric nuclear detonation.

The monitoring system's effectiveness, however, is limited because of noise from infrasound signals produced by natural sources, such as wind, surf, and thunder, and by anthropogenic activity, such as mining, industrial operations, and flying aircraft. To improve the identification of atmospheric detonations (or any other signal of interest for the global infrasound network), Matoza et al. have devised a method to eliminate irrelevant sensor noise. Unlike previous research, which treated all noise affecting the infrasound sensors equally, they split the noise into two categories: coherent noise, produced by consistent infrasound sources but that is unrelated to the signals of interest, and incoherent noise, infrasound produced by random sources such as wind.

Analyzing the observations of 39 infrasound stations from April 2005 to December 2010, the authors identify consistent sources of coherent noise, including ocean microbaroms, volcanic eruptions, the sounds of the surf and thunder, and human activity. Identifying the frequencies associated with different noise sources could improve signal processing,

which would in turn improve an infrasound array's ability to isolate the signals it is designed to monitor.

More information: Coherent ambient infrasound recorded by the International Monitoring System, *Geophysical Research Letters*, doi: 10.1029/2012GL054329 , 2013 onlinelibrary.wiley.com/doi/10 … 012GL054329/abstract

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