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-driven parameterization for CLEAN beamforming

Ambient noise varies both in space and time, resulting in multiple source locations with varying strength. Interfering sources are not always correctly resolved when classical beamforming methods are applied. Various beamforming methods exist in literature for a better discrimination of multiple continuous sources. One of these methods, CLEAN, is discussed here. The CLEAN method iteratively selects the maximum of the f/k spectrum, removes it and stores it in a new spectrum. Nonlinear ocean wave interaction generates signals that radiates in ocean, atmosphere and solid earth. These low frequency signals dominate the ambient noise field, around 0.2Hz (microbaroms(atmosphere) and microseisms(solid earth)). To detect and characterise these continuous signals, infrasound and seismic arrays of the International Monitoring System (IMS) are used. Those arrays are build to monitor nuclear test, for the verification of the Comprehensive Nuclear Test Ban Treaty (CTBT), failing to exclude the ambient noise field consequentially increase the false-alarm rate. This research tests CLEAN elaborately and proposes a data-driven method to parameterise the beamforming algorithm. The use of Fisher statistics is proposed to help determine the stopping condition for CLEAN and to indicate the source strengths. Results are obtained by applying CLEAN on synthetic data and on IMS data.

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