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the Variability of Earth's Microseisms Through Signal Coherency Analysis

For the purpose of a long-term self-noise study of the STS-2 seismometer, four co-aligned sensors were deployed side by side at the Conrad Observatory (Austria) over a four year time span. The analysis of the recorded data shows that self-noise estimates computed using the standard three-sensor coherency method strongly depend on accurate sensor alignment, and that for vertical components misalignment of sensors almost exclusively disturbs self-noise spectra within the frequency band of Earth's secondary microseisms. Insufficient sensor alignment as small as 1/100 of a degree or less can cause incoherencies between the three sensors' recorded signal, which can be detected in the self-noise spectra. In this work we show that this effect can be used to study the variability of secondary microseisms, as the amount of disturbing signal "leaking" into the self-noise estimates depends on microseisms' activity and the angle of misaligment. Intentionally misaligning seismic traces by numerical trace rotation about small angles results in disturbances of the self-noise spectra that primarily depend on microseismic activity. Results show that the technique is able to detect the increased amount of Rayleigh-waves during events as microseismic storms or hurricanes, potentially rendering this method a means to better observe and study Earth's microseisms.

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