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Observations from a Long-Term Self-Noise Experiment at the Conrad Observatory, Austria

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An analysis of four years of data recorded between 2012 and 2015 by four collocated and co-aligned seismic broadband sensors (STS-2) reveals that the quality of self-noise estimates computed using the three-channel spectral correlation technique shows significant variation, which on first order appears to be related to seasonally changing microseismic activity.

We compute self-noise estimates for every day within the time-frame studied, and from these derive probability density representations of self-noise for each of the four sensors and their components. During self-noise computation we apply a recently developed approach to correct sensor misalignment during the experiment by numerical trace rotation, and are thus able to study the efficiency of this correction technique under varying conditions, as well as compare results for non-aligned sensors with those after performing the sensor alignment procedure.

Seasonally separating the resulting probability density functions allowed us to study the influence of the general noise conditions on the quality of our self-noise estimates, as well as possible limits of increasing coherence by numerical trace rotation.

Results show that for vertical components good-quality self-noise estimates can be, with few exceptions, computed almost all through the year. Numerically rotating traces to improve sensor alignment has a strong and visible effect of improving coherence between recorded traces. However, our results also indicate that no trace rotation is necessary to improve alignment during some of the microseismically quietest days of the year around the month of July.

The amount of self-noise disturbance found within the secondary microseisms' frequency band correlates with the angle of misalignment between sensors as well as with signal strength. Previous, rough estimates of around 10 dB/0.1 degree of misalignment could be revised and a rough relationship with signal strength established.

Our results indicate that microseismically quiet days, possibly during the summer months, are best suited for self-noise experiments. Aligning traces helps improving self-noise estimates for vertical components under almost all conditions, for horizontal traces self-noise in most cases is disturbed in the long periods to an extent that trace rotation only yields little improvement.