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Self-Noise of the STS-2 and sensitivity of its computation to errors in alignment of sensors

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The assessment of a seismometer's self-noise is an important part of establishing its health, quality, and suitability. A spectral coherence technique proposed by Sleeman et al. (2006) using synchronously recorded data of triples of collocated and co-aligned seismometers has shown to be a very robust and reliable way to estimate the self-noise of modern broadband seismic sensors.

It has been demonstrated in previous works that the resulting self-noise spectra, primarily in the frequency range of Earth's microseisms, are considerably affected by small errors in the alignment of sensors. Further, due to the sensitivity of the 3-channel correlation technique to misalignment, numerical rotation of the recorded traces prior to self-noise computation can be performed to find best possible alignment by searching for minimum self-noise values.

In this study we focus on the sensitivity of the 3-channel correlation technique to misalignment, and investigate the possibility of complete removal of the microseism signal from self-noise estimates for the sensors' three components separately.

Data from a long-term installation of four STS-2 sensors, specifically intended for self-noise studies, at the Conrad Observatory (Austria) in a collaboration between the KNMI (Netherlands) and the ZAMG (Austria) provides a reliable basis for an accurate sensitivity analysis and self-noise assessment.

Our work resulted in undisturbed self-noise estimates for the vertical components, and our current focus is on improving alignment of horizontal axes, and verification of the manufacturer's specification regarding orthogonality of all three components. The tools and methods developed within this research can help to quickly establish consistent self-noise models, including estimates of orthogonality and alignment, which facilitates comparison of different models and provides us with a means to test quality and accuracy of a seismic sensor over its life span.