METHOD FOR SELF-NOISE ESTIMATES IN BROADBAND SEISMOMETERS

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1. Introduction

1.1. **Self-Noise Test Setup.** Depending on the type of instrument and frequencies of interest a number of different test configurations and methods have been developed. Our goal here is to simply give the setup guidelines for routine broadband self-noise estimates. We do not focus on the more complex problem of better constraining the long-period self-noise of a seismometer.

(1) Install three seismometers (2 references and 1 test sensor) in a a quiet vault. The sensors should be installed as close as possible without interfering with additional thermal isolation. This should include a fleece cap as well as an exterior foam box.
(2) Once the sensors have been installed being recording data an a digitizer with sufficient resolution to record the noise of the seismometers. To verify that your digitizer has sufficient resolution you can perform this self-noise test on data from the digitizer that has been obtained by terminating the output with a 10 Ω resistor. No part of the self-noise of the digitizer should be above the self-noise of the seismometer that you will be testing.
(3) Record all sensors at 40 samples per second.
(4) After the sensors have settled sufficientely collect 6 hours of data where there are no transients larger than XX above the standard deviation of the time window being used.
(5) Estimate the self-noise by computing the corss-powers between all three sensors in test. For estimating the cross-power use a Welch method with a 5% cosine taper, windows with 2^14 points and 2^12 points of overlap.

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(6) Using the nomainl response correct the power and the noise estimated in the previous step. Your results should now be in units of $(m/s^2)^2/Hz$.

(7) Convert from linear units to dB.

(8) Plot all results relative to the Peterson NLNM.

References

[1] Sleeman, R., van Wettum, A., and Trampert, J. Bull. Seism. Soc. Am. **96**, 258–271 (2006)

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