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The Analytical Estimates of Broadband Seismic Instrument Self-Noise to Environmental Variations

Environmental sensitivity is sensitivity of instrument to environment (changes of pressure, temperature, magnetic field, etc.). To provide the best quality of the seismic data you have to understand the non-seismic noise sources and how to avoid them. For many years we investigated the effects that changes in external conditions have on the operation of broadband devices. We investigated effects such as changes of temperature, air pressure, magnetic field, humidity, examined the effects of thunderstorms, vibration, air currents, gravitational excitation, and so on. We examined the design elements of instruments, determined the effects of inelastic spring strain, Brownian motion, verified the sensitivity of the broadband instrument's response function to variations the parameters of the elements around nominal values, and so on. There is no single solution to the design of seismic instruments. The best solution will depend on the some conditions: sensitivity, noise level, cost, dimensions, conveniences of manufacture, installation and operation and so on. The effect of the environment can be minimized at the stage of designing the device. Analysis was done in a general way and can be applied to the sensors of any design. Our hope is that this will lead to robust estimates of sensor self-noise.

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