

# Stability of Monitoring Weak Changes in Multiply Scattering Media with Ambient Noise Correlation: Laboratory Experiments.

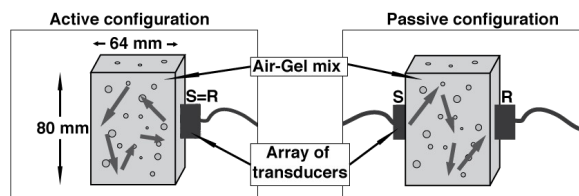
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Small changes in a dynamic, multiply scattering medium can be monitored by observing phase shifts in the coda. Passive monitoring of weak changes through ambient noise correlation has already been applied to seismology, acoustics and engineering. Usually, this is done under the assumption that a properly reconstructed Green function as well as stable background noise sources are necessary, as is the case with passive imaging. In seismology many parameters remain unknown or uncontrolled. In a passive field experiment, scientists face two simultaneous problems. They neither know the source location with sufficient precision, the source mechanism, nor the medium of propagation. It is therefore very complex to characterize the source and the medium at the same time. By reproducing some features of the seismic propagation in the laboratory and employing controlled sources and sensors, we can focus our efforts on the physics of the wave propagation and develop or evaluate new methods more comfortably.

In order to further develop the passive monitoring technique, we perform a laboratory experiment in the 2.5MHz range in a gel with scattering inclusions. We compare an active (pulse-echo) form of monitoring to a passive (correlation) one. The results show that small temperature changes in the medium can be observed even if the Green function of the medium is not reconstructed.

We also establish that relative stability of the background noise structure is a necessary condition in the case where the Green function is not reconstructed.



**Figure 1.** Experimental setup. Left: the active experiment in the pulse-echo configuration. Right: the passive experiment in the transmission configuration before autocorrelation.

## References

C. Hadziioannou, E. Larose, O. Coutant, P. Roux and M. Campillo: Stability of Monitoring Weak Changes in Multiply Scattering Media with Ambient Noise Correlation: Laboratory Experiments., *J. Acoust. Soc. Am.* 125 in press (2009)