

# Scattering Correlations in a Granular Chain

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## ABSTRACT

Wave propagation in disordered, random continuum/granular matter made of discrete particles is accompanied by scattering in the elastic/weakly elastic regime. Residual energy remains in the particles through which the elastic wave has propagated. The multiple scattering of elastic waves leads to the formation of coda [1] since, unlike in homogeneous continuum bodies, granular materials like soil exhibit prominent scattering because each particle can act as a scatterer.

Displacement, velocity and energy correlations of particles have been analyzed both in real as well as Fourier space (frequency and wavenumber) through which the bulk properties of media like sound propagation velocity, scattering attenuation parameters and dispersion relations have been obtained [3]. The correlations and hence, the bulk parameters were determined for disordered granular chains which form the backbone of energy and information/stress transfer in a granular matter.

It was observed that in a disordered granular chain, attenuation increases due to scattering with increase in disorder of the granular chain. The adopted protocol for calculation of the sound wave velocity and scattering attenuation parameter do not diminish the scattering effects as observed during ensemble averaging.

The multiply scattered waves contain information about the medium through which the waves have traversed as they are correlated to each other in the frequency/wavenumber space. These correlations usually get washed out on ensemble averaging because of their random nature in time. Retaining the information lost during averaging may assist in increasing the signal to noise ratio and hence, reduce costs during seismic oil/gas/mineral exploration, non-destructive testing of materials or, monitoring weak changes in a medium using Coda Wave Interferometry [2].

## REFERENCES

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