

Retrieving the elastodynamic Green's function of arbitrary inhomogeneous media by cross-correlation

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Recently it has been shown by various authors that the Green's function of a random medium can be obtained by cross-correlating the recordings of a diffuse wave field at two receiver positions (Weaver and Lobkis, 2001; van Tiggelen, 2003; Snieder, 2004). The resulting Green's function is the wave field that would be observed at one of these receiver positions if there were an impulsive source at the other. An initially independent line of research, developed by exploration seismologists, deals with the reconstruction of the seismic reflection response of a deterministic medium from (passive) recordings of the transmission response. Already in 1968 Claerbout showed that the autocorrelation of the transmission response of a horizontally layered earth yields the reflection response. Later he conjectured for 3-D deterministic media that 'by cross-correlating noise traces recorded at two locations on the surface, we can construct the wave field that would be recorded at one of the locations if there was a source at the other'. In this presentation we compare the 'random medium approach' (Weaver and others) with the 'deterministic medium approach' of exploration seismology and discuss the underlying assumptions. Moreover, we discuss applications in passive seismic imaging.