
S32A **MCC: 3006** **Wednesday** **1020h**

Oil at the Core-Mantle Boundary? Bridging the Gap Between Exploration and Global Seismology I (*joint with T*)

Presiding: R Snieder, Colorado School of Mines; **S A Levin**, Landmark Graphics Corporation

1020 h **S32A-01** *INVITED* Retrieving the Green's Function by Cross-correlation: a Comparison of Approaches: **K Wapenaar**, D Draganov

1045 h **S32A-02** *INVITED* Virtual Sources, a new Reality for Imaging.: **R W Calvert**, A Bakulin

1110 h **S32A-03** *INVITED* Migration, Tomography and Datuming by Seismic Interferometry: **G Schuster**, J Yu, J Sheng

1135 h **S32A-04** *INVITED* Generation and Mitigation of Surface-Generated Scattered Phases in Teleseismic Imaging.: **C Poppeliers**

1200 h **S32A-05** *INVITED* Computational Problem in Three-Dimensional, Plane-wave Imaging with P to S Converted Waves Recorded by Broadband Arrays: **G L Pavlis**, Z Yi

10:20h

S32A-01 [Abstracts]

Retrieving the Green's Function by Cross-correlation: a Comparison of Approaches

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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. This theoretical result has first been demonstrated with ultrasonic measurements and later with seismic surface waves (Campillo and Paul, 2003). The accuracy of the reconstructed Green's function depends on the amount of disorder of the medium parameters and the duration of the signal. Ideally the cross-correlations should be done in the equipartitioned regime (where the net energy flux is equal to zero), which takes place after sufficiently long multiple scattering of the wave field between the heterogeneities in the disordered medium (Malcolm, Scales and van Tiggelen, 2004). 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 superposition of the reflection response and its time-reversed version. The source in the subsurface may be a transient or a noise signal; in both cases the source signature in the reconstructed reflection response is the autocorrelation of the source signal in the subsurface. Claerbout's derivation was strictly one-dimensional. Later he conjectured for the 3-D situation 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'. Although it was not explicitly stated, this conjecture applies to deterministic media: in exploration seismology the earth is usually considered to be built up of geological layers with smoothly varying properties, separated by well-defined curved interfaces and faults which act as the main reflectors; scattering due to disorder of the parameters within the geological layers is generally considered a second order effect. Numerical modelling studies have been carried out to confirm Claerbout's conjecture (Rickett and Claerbout, 1996). These modelling studies showed that 'longer time series, and a white spatial distribution of random noise events would be necessary for the conjecture to work in practice'. The cross-correlation approach has been applied successfully to helioseismic data (Duvall et al., 1993). Recently Claerbout's conjecture has been proven by the authors. The proof also explains the observations of the numerical modelling studies. [Wapenaar, K., J. Thorbecke, and D. Draganov,

Relations between reflection and transmission responses of 3-D inhomogeneous media, Geoph. J. Int., 156, 179-194, 2004]. In this paper we compare the 'random medium approach' (Weaver etc.) with the 'deterministic medium approach' of exploration seismology and discuss the underlying assumptions. Moreover, we discuss applications in passive seismic imaging.

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Seismology [S]

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