

Seismic Interferometry – Reconstruction of the Earth's Elastodynamic Reflection Response

Deyan Draganov and Kees Wapenaar

Department of Geotechnology, Delft University of Technology, The Netherlands

Seismic interferometry is the process of creating new seismic records from the cross-correlation of existing ones. Taking a seismic trace at point A and correlating it with another trace at point B, one receives a new seismic trace at B as if from a source at A. The original seismic traces at A and B can be from active sources (surface or subsurface) or from passive sources (noise).

Global seismology uses mainly passive recording to derive information about the Earth. In exploration seismology, the idea to use passive noise recordings was first proposed in 1968. In recent years, the interest to seismic interferometry is increasing very fast.

We show how to reconstruct the elastodynamic Green's function at the surface from passive noise sources in the subsurface. To reconstruct all the components of the Green's function, one needs to obtain 3-component recordings from the noise sources. If the subsurface sources are close to the free surface, after cross-correlation one reconstructs mainly surface waves. When the noise sources are relatively deep, one reconstructs body waves. The relative position of the recorders to the subsurface sources predefines the appearance of the reconstructed waves in the causal and/or anti-causal part of the reconstructed Green's function.