Geophysical Research Abstracts
Vol. 13, EGU2011-2503-1, 2011
EGU General Assembly 2011

Computing green functions by simulating seismic noise using the Spectral Element Method

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The long term goal of this work is to improve tomographic images resulting from noise correlations. More specifically we address two questions that relate to each other : 1) Is it possible to compute noise correlation by simulating ambiant noise using the Spectral Element Method and 2) is it possible to "denoise" noise correlations using auto adaptive filters.

Indeed seismic ambient noise correlations have been successfully used to develop tomographic models of the crust. However this method is still limited since correlations are inverted 1) using ray theory and 2) assuming that the noise sources are evenly distributed in the medium so that the correlations contain the Green function of the medium which is not true in practice.

To go beyond this two limitations we investigate the possbility to simulate seismic ambient noise in a 3D medium using the Spectral Element Method. This would be useful to 1) compute synthetic correlations in a 3D starting model and 2) to take into account the uneven distribution of noise sources when inverting the correlations.

To that end we use RegSEM to simulate seismic noise sources and to compute synthetic correlations at the regional scale in the 20-50s period band. We study the convergence time of the correlation towards the Green function and the best way to denoise noise correlations.