Geophysical Research Abstracts
Vol. 14, EGU2012-9685, 2012
EGU General Assembly 2012

Non-linear inversions for the origin of ambient noise

T. Nissen-Meyer (1), S. Hanasoge (2), L. Stehly (3), and P. Cupillard (4)

(1) ETH Zurich, Institute of Geophysics, Switzerland (tarjen@ethz.ch), (2) Princeton University, Department of Geosciences, USA, (3) Geoazur Nice, Sophia-Antipolis, France, (4) Institut de Physique du Globe Paris, France

Using ambient seismic noise as data for tomographic imaging has become a prominent tool to derive structural models inregions with little seismicity. Typically noise cross-correlations are equated to Green's functions, an assumption that can prove inaccurate when sources are non-uniformly distributed. Similar to earthquake-based tomography, source parameters of the noise origin may play a crucial role for any reliability of tomographic images. Moreover, the spatial (ocean-continent interactions?), temporal (seasonal variability?) and spectral distribution (location-dependent frequency bands?) as well as underlying physical nature are not fully understood. In this study, we attempt to focus on the spatial distribution of noise by means of nonlinear inversions.

We model seismic noise as arising from a spatially fixed distribution of temporally stochastic sources on the surface of Earth. By treating seismic correlations between pairs of stations as expectation values of this random excitation, we are able to formally interpret these measurements in terms of Green's functions of the medium and the distribution of wave sources. To simplify the analysis, we use 1-D Green's functions (PREM) excited over the surface of the Earth. We present preliminary inversions of noise-correlation amplitudes around southern California and Ecuador, which confine the frequency-dependent source locations to narrow bands along the ocean-continent line. Because the problem is computationally cheap, we can perform Gauss-Newton inversions, fully capture model and data uncertainties, allowing us to place well reasoned error bars on our inversion.