2:20

2pUW4. Extraction of the Green's function from ambient fluctuations for general linear systems. Roel Snieder (Ctr. for Wave Phenomena, Colorado School of Mines, 1500 Illinois Str., Golden, CO 80401-1887, rsnieder@mines.edu) and Kees Wapenaar (Delft Univ. of Technol., 2600 GA Delft, The Netherlands)

The extraction of the Green's function of acoustic and elastic waves from ambient fluctuations is by now a technique that is theoretically well-described and that has successfully been used in different applications. We show theoretically that the principle of the extraction of the Green's function can be generalized to a wide class of linear systems. These new applications include the diffusion equation, Maxwell's equations, a vibrating beam, and the Schröedinger equation. For systems that are invariant for time-reversal it suffices to have sources of ambient fluctuations on a surface that bounds the region of interest. When the invariance for time-reversal is broken; as, for example, in the case of the diffusion equation or for wave propagation in attenuating media, one also needs sources of ambient fluctuations throughout the volume. This work opens up new opportunities to extract the Green's function from ambient fluctuations that include electromagnetic fields in conducting media, flow in porous media, wave propagation in attenuating media, monitoring of mechanical structures, and quantum mechanics.

2:45

2pUW5. Dispersion curves and small-scale geophysics using noise cross-correlation techniques. Philippe Roux, Pierre Gouedard, and Cecile Cornou (LGIT, CNRS 5559, Universite Joseph Fourier, Grenoble, France)

It has been demonstrated, both theoretically and experimentally, that the Green's function between two receivers can be retrieved from cross-correlation of isotropic noise records. Since surface waves dominate noise records in geophysics, tomographic inversion using noise correlation techniques have been performed from Rayleigh waves so far. However, very few numerical studies implying surface waves have been conducted to confirm the extraction of the true dispersion curves from noise correlation in a complicated sedimentary ground model. In this work, synthetic noise has been generated in a small-scale (<1 km) numerical realistic environment and classical processing techniques are applied to retrieve the phase velocity dispersion curves in the medium, first step toward an inversion. We compare results obtained from SPAC (spatial auto-correlation method) and noise correlation techniques on a ten-element array. Two cases are presented in the (1–20 Hz) frequency bandwidth that corresponds to an isotropic or a directional wavefield noise.

3:10

2pUW6. Ambient seismic noise and teleseismic tomography in the western USA: High-resolution 3-D model of the crust and upper mantle from Earthscope/USArray. Yingjie Yang, Michael Ritzwoller, Morgan Moschetti (Ctr. for Imaging the Earths Interior, Dept. of Phys., Univ. of Colorado at Boulder, Boulder, CO 80309), and Donald Forsyth (Brown Univ., Providence, RI 02912)

Short-period surface wave dispersion measurements are extremely hard to obtain from teleseismic events due to scattering and attenuation. Ambient seismic noise is rich in short-period surface waves from which the Rayleigh wave Green function between pairs of stations can be extracted by cross-correlating long noise sequences. Tomography based on surface wave dispersion obtained from the estimated Green functions has been shown to produce high-resolution, short-period (6–30 s) surface wave dispersion maps that principally image crustal geological units (e.g., southern California: Shapiro *et al.*, 2006; Europe: Yang *et al.*, 2007). In this study, we measure phase velocity dispersion curves from the ambient noise cross-correlations to obtain phase velocity maps at periods from 6 to 30 using data from the transportable array component of USArray. A two-plane-wave tomography method including finite-frequency effects was employed to obtain phase velocity maps at complementary periods from 25 to 150 using teleseismic events. The combined phase velocity data set from 6 to 150 is used to invert for high-resolution 3-D Vs structure from the surface to $\sim$ 200 km depth beneath the western USA. The new 3-D Vs model can be used to interpret regional tectonics, model seismic wave propagation, and improve earthquake location.

3:35–3:50 Break

Contributed Papers

3:50

2pUW7. Monitoring a volcano with passive image interferometry. Christoph Sens-Schönfelder[a] and Ulrich Wegler[b] (Universität Leipzig, Talstrasse 35, 04103 Leipzig, Germany)

Ambient seismic noise has been used successfully as a source of information for structural investigations. Ballistic surface as well as body waves were reconstructed by correlation of noise and used in tomographic studies. In these cases it is of course assumed that the medium under study is stationary, i.e., that the reconstructed Green's function does not change with time. In this contribution we show that medium changes can well be monitored by means of subtle changes in the Green's function. Using an interferometric approach applied to the coda part of the Green's function, we detect temporal changes of delay times on Merapi volcano (Indonesia). The changes of delay time depend on lapse time, which indicates that the velocity changes inside the volcano are spatially heterogeneous. We present a hydrological model that can explain the temporal changes of delay time as well as its lapse time dependence changes of the ground water level induced by precipitation. From this analysis we conclude that (a) seismic coda can be practically retrieved from noise correlations, (b) temporal changes can be monitored with noise correlations, (c) even spatial heterogeneity of the changes can be identified, and (d) the coda retrieved from noise correlations is composed body waves. [a]Currently at LGIT Grenoble, France. [b]Currently at SZGRF/BGR Erlangen, Germany.

4:05

2pUW8. Passive measurements of random wave fields in an instrumented structure. Karl A. Fisher, David H. Chambers, and Sean K. Lehman (Lawrence Livermore Natl. Lab., Livermore, CA 94551)

A passive measurement system using fiber Bragg gratings is presented to interrogate the health of an instrumented part. Estimation of the structures Green's function from diffuse sound fields present during typical operating conditions is the basis for our approach. Experimental studies are conducted using coherent processing techniques of random and generated sound fields to investigate a structure for defects and/or deviations from an initial or pristine state. We are interested in developing a moni-