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Tomography of the Dead Sea Fault region using BB Seismic Noise

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Ambient noise tomography is a rapidly emerging field of seismological research. The method is based on computing the cross-correlations of the long-term continuous broad-band (BB) recordings at pairs of stations to estimate 3D seismic velocity structure of the region.
The method was applied to the continuous (6-12 months) BB recordings of the 30 stations of the DESERT2000 experiment distributed across the Arava Fault (South of the Dead Sea basin) as well as the 6 permanent (several years data) BB stations of ISN spread throughout the country. The data have been band-passed filtered in the 2-50 sec range and pre-processed to eliminate influence of earthquakes and explosions according to the methodology developed at Colorado University, Boulder. The cross-correlation functions of the processed data for each pair of stations have been used to compute group and phase velocity dispersion curves of Rayleigh waves, which have been used in turn to compute tomography images of the region in terms of the Rayleigh waves group and phase velocity determined at the coordinate grid points for fixed periods (8–20 sec). Then the set of tomography images have been converted into a 3D table of S and P velocities, combined of the 1D velocity profiles at each grid point.
The tomography image at fixed periods and the obtained 3D velocity models fit well with the existing tectonic elements in the study area. A narrow low velocity anomaly in the crust coincides with the Dead Sea transform that is interpreted as sediments in the shallow layer and a zone of fractured and deformed rocks in the middle and lower crust. The zone of high velocities on the eastern bank of the DST fit well with the previous reporting based on body wave tomography, seismic refraction studies and field observations of exposed crystalline basement in the South-Western Jordan. A number of verification and quality control procedures have been performed to confirm reliability of the results obtained as well as the level of the resolution power.