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S-wave velocities in the crust from noise analysis

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Recent results (e.g. Shapiro and Campillo, 2004) show that it is possible to exctract part of the Green's function between two stations through cross-correlation of the seismic records. We use this approach on data from 39 broadband stations which were part ofthe SVEKALAPKO Seismic Tomography experiment in Finland. We used data from the 6 month's period, for which the stations were all operating. Prior to analysis, all seismic events with magnitude over 5.0 were removed. The time window that was cut out was two hours for magnitudes 5.0-5.5, and increased to 24h for magnitudes over 7.0. All records were visually inspected to remove traces with mass centering and spikes, which could otherwise dominate the cross-correlations. We obtain a total of over 700 intercorrelations, distributed at distances between 20 and 450km. The seismic section of all the traces show that it is possible to identify a wave which is coherent over the whole distance range, in the period range 2-25s. This wave can be identified as the fundamental mode Rayleigh wave with dispersion characteristics that are in excellent agreement with previous results from the area (Bruneton et al., 2004), and which further extends the frequency range of the dispersion down to 2s, as compared to the 10s minimum period obtained by Bruneton et al. (2004). If the seismic noise was isotropic, it would show the Green's function (or rather, the part that we can extract) as symmetrical waveforms around t=0. Such symmetry is present for the longest periods (>20s). At shorter periods, the noise is on the contrary dominated by noise sources west of the array, most probably at the Atlantic Coast (Friedrich et al., 1998). Even though the short-period noise sources are not randomly distributed, the extracted wave is independent of profile direction. We therefore conclude that also in the case of a non-isotropic diffuse wavefield, it is possible to extract part of the Green's function between two stations.

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