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Velocity model of the Bohemian Massif crust (Central Europe) from Ambient Noise data

Jiri Kvapil, Ludek Vecsey, and Jaroslava Plomerova
Institute of Geophysics, The Czech Academy of Sciences, Prague, Czech Republic (j.kvapil@ig.cas.cz)

Cross-correlation of ambient seismic noise, recorded at station pairs, is now well established technique for surface wave extraction and crustal shear wave velocity imaging. Recent teleseismic tomography studies of the upper mantle beneath the Bohemian Massif (BM) emphasized great importance of crustal velocities on the resulting upper mantle tomography image down to the depth of about 100 km (Karousova et al., 2012). The BM crust velocity model used in teleseismic tomography was compiled by integrating interpretation of several seismic exploration profiles as well as with information from receiver function method. In this study we aimed at retrieving initial independent and homogeneous model of the BM crust from seismic interferometry as a starting point for upcoming ambient noise tomography.

In the first step, we apply ambient noise interferometry on data recorded at permanent stations of the Czech Regional Seismic Network (CRSN). The data are pre-processed following well established ambient noise processing sequence (e.g., Bensen et al., 2007), which includes instrument response removal, demeaning, detrend, downsampling, amplitude normalisation and spectral whitening. We also test different amplitude normalisation schemas - one bit normalisation, daily RMS waveform clipping, running average normalisation and automated earthquake editing. In the next step, the seismic noise was cross-correlated on all possible station pairs over one month of continuous data. The stability of constructed surface waves was confirmed by seasonal variation test. Finally, we performed frequency-time analysis (FTAN) in order to measure group velocity dispersion curves. We present frequency dependent surface-wave group-velocity maps across the BM, evaluate their lateral and directional variations, which we correlate with tectonics of the region and with velocity model of the Bohemian Massif crust used in teleseismic tomography, or with local travel times, used in interpretation and location of near earthquakes.