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High-Resolution Velocity Model of the Bohemian Massif Crust from Layer Stripping Ambient Noise Tomography

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We build a new shear-wave velocity model of the crust of the Bohemian Massif (BM) from ambient seismic noise. We closely followed the well-established surface-wave tomography sequence, which includes instrument response removals, the seismic noise cross-correlations of station-pair waveforms, signal stacking over summer-time period, frequency-time analysis (FTAN) for Rayleigh-wave group velocity dispersions, automated velocity-period picking and the 2D fast-marching surface tomography (FMST) followed by the 1D non-linear Monte Carlo inversion to retrieved layered velocity model of the crust.

In order to model the BM crust down to the Moho with an optimal lateral resolution in the scale of tectonic units we processed continuous waveforms from all available broad-band permanent stations in the region of 46-54° N and 7-21° E, complemented by recordings from temporary stations of passive seismic experiments BOHEMA I-IV, PASSEQ, EGER RIFT, ALPARRAY-EASI and ALPARRAY-AASN. The lateral resolution and depth penetration was confirmed by checkerboard tests and by estimated effective sensitivity kernels. Four hundred four stations active in overlapping periods provided about 21.000 dispersion curves as an input for surface-wave inversion at high-density grid size of 22 by 22 km. Since the inversion of surface-wave dispersions does not provide a unique solution, several hundred thousand of possible models need to be evaluated by the Monte Carlo algorithm. In order to decrease depth uncertainty of resulting velocity models and to limit the total number of generated models we carried out a layer stripping depth approach which can be understood as a restart of stochastic inversion at the bottom of previously derived layer. This approach also benefits from independent misfit measure for each layer.

We compare the resulting crustal shear-wave velocity models with tectonics of the region, the Moho depth from P-wave receiver functions and velocity models from seismic refraction and wide-angle reflection experiments.