A new 3D shear velocity model of the wider Vienna Basin region from ambient noise tomography

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Accurate velocity models of the Earth are a prime result of seismological study, which are useful on one hand for understanding the tectonic evolution of an area, and on the other hand for improving the evaluation of natural resources, and for better locating seismic events. The Vienna Basin (VB) is generally thought to be an area of low seismicity and low to moderate seismic hazard, but some authors argue that the seismic hazard in the region is underestimated.
In this study, we retrieve a shear velocity model of the crust in and around the VB. We use continuous seismic records of 63 broadband stations (47 temporary stations of the temporary AlpArray network (http://www.alparray.ethz.ch) and 16 permanent stations, operated by national services) to retrieve inter-station Green's Functions from ambient noise cross correlations in the period range of 5s - 25s. From these Green's Functions we measure Rayleigh wave group travel times and invert them to retrieve a 3D shear velocity model of the study area in the top 30km. The resulting model provides previously unachieved resolution in this area, and matches well with the few known crystalline basement depths from boreholes. For depths, larger than those reached by boreholes, the new model allows new insight into the complex structure of the VB and surrounding areas, including deep low velocity zones. The new model will also open new possibilities for improving earthquake locations, and for better predicting ground motions associated with potential earthquakes in the area.