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Phase velocity measurements in central Europe from seismic ambient noise

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We are developing a new database of surface-wave phase-velocity dispersion curves derived from seismic ambient noise, cross-correlating continuous seismic recordings from the Swiss Network, the German Regional Seismological Network (GRSN), and from the Italian national broadband network operated by the Istituto Nazionale di Geofisica e Vulcanologia (INGV), plus some stations from the Mediterranean Very Broadband Seismographic Network (MedNet) and from the Austrian Central Institute for Meteorology and Geodynamics (ZAMG). In order to increase the aperture of the station array, additional measurements from the French Broadband Seismological Network and the Slovenia Seismic Network are also included.

The ambient noise we are using to assemble our database was recorded at the mentioned stations between January 2006 and December 2007. The Green function method, applied to continuous signal recorded at pairs of stations allows to extract from ambient noise coherent surface-wave signal travelling between the two stations. Usually the ambient-noise cross-correlation technique allows to have infomation at periods of 30 s or shorter. Our efforts are focused on extending this technique to longer periods. At this point we are able to obtain coherent dispersion curves at periods from 8 to 35 s.

At a second stage, the data set of phase delay associated with a certain frequency of Rayleigh waves can be inverted, to determine a 2-dimensional phase-velocity map of the European region. The inversion is conducted by means of a linearized tomographic inversion algorithm. We are now able to obtain 2D Rayleigh-wave phase-velocity maps at periods between 8 to 35 s. We next test the compatibility of these maps with those that we obtain from teleseismic measurements made at the same stations. The final goal of this study will be a 3D model of crust and upper mantle. This model will represent an important improvement over exisiting models, in that it will simultaneously explain observations made at very different frequencies.