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3D crustal structure of the Alpine belt and foreland basins as imaged by ambient-noise surface wave

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We derive a 3-D crustal structure (S wave velocity) underneath northern Italy and the wider Alpine region, from an extensive data set of measurements of Rayleigh-wave phase- and group-velocities from ambient noise correlation among all seismographic stations available to date in the region, via a constrained tomographic inversion made to honor detailed active source reflection/refraction profiles and other geological information.
We first derive a regional-scale surface wave tomography from ambient-noise-based phase- and group- surface wave velocity observations (Verbeke et al., 2012). Our regional 3D model (Molinari et al., 2015) shows the low velocity area beneath the Po Plain and the Molasse basin; the contrast between the low-velocity crust of the Adriatic domain and the high-velocity crust of the Tyrrhenian domain is clearly seen, as well as an almost uniform crystalline crust beneath the Alpine belt.
However, higher frequency data can be exploited to achieve higher resolution images of the Po Plain and Alpine foreland 3D crustal structure. We collected and analyze one year of noise records (2011) of $\sim$100 North Italy seismic broadband stations, we derive the Green functions between each couple of stations and we measure the phase- and group-Rayleigh wave velocity. We conduct a suite of linear least squares inversion of both phase- and group-velocity data, resulting in 2-D maps of Rayleigh-wave phase and group velocity at periods between 3 and 40s with a resolution of 0.1x0.1 degrees. The maps are then inverted to get the 3D structure with unprecedented details. We present here our results, we compare them with other studies, and we discuss geological/geodynamical implications.
We believe that such a model stands for the most up-to-date seismological information on the crustal structure of the Alpine belt and foreland basins, and it can represent a reliable reference for further, more detailed, studies to come, based on the high seismograph station density being accomplished by the AlpArray project.