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Seismic Tomography Around the Eastern Edge of the Alps From Ambient-Noise-Based Rayleigh Waves

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Inspecting ambient noise Green's functions is an excellent tool for monitoring the quality of seismic data, and for swiftly detecting changes in the configuration of a seismological station. Those Green's functions readily provide stable information about structural variations near the Earth's surface. We apply the technique to a network consisting of about 40 broadband stations in the area of the Easternmost Alps, in particular those operated by the University of Vienna (AlpArrayAustria) and the Vienna University of Technology. Those data are used to estimate Green's functions between station pairs; the Green's function consist mainly of surface waves, and we use them to investigate crustal structure near the Eastern edge of the Alps.

To obtain better signal-to-noise ratios in the noise correlation functions, we adopt a procedure using short time windows (2 hr). Energy tests are performed on the data to remove effects of transient sources and instrumental problems. The resulting 9-component correlation tensor is used to make travel time measurements on the vertical, radial and transverse components. Those measurements can be used to evaluate dispersion using frequency-time analysis for periods between 5-30 seconds. After rejecting paths without sufficient signal-to-noise ratio, we invert the velocity measurements using the Barmin et al. (2001) approach on a 10 km grid size.

The obtained group velocity maps reveal complex structures with clear velocity contrasts between sedimentary basins and crystalline rocks. The Bohemian Massif and the Northern Calcareous Alps are associated with fast-velocity bodies. By contrast, the Vienna Basin presents clear low-velocity zones with group velocities down to 2 km/s at period of 7 s. The group velocities are then inverted to 3D images of shear wave speeds using the linear inversion method of Herrmann (2013). The results highlight the complex crustal structure and complement earthquake tomography studies in the region. Updated results will be presented at the meeting.