Eastern Alpine Seismic Investigation (EASI): aims, deployment and results

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During the first implemented Complementary experiment within the AlpArray (http://www.alparray.ethz.ch) framework, namely EASI (Eastern Alpine Seismic Investigation), 55 three component broadband seismic stations have been deployed along a 540 km profile crossing the Eastern Alps, from the Czech-German border to the Adriatic Sea.

The seismic array has continuously recorded over one year of time from summer 2014 till summer 2015; the stations deployed with an alternate geometry are spaced of about 15 km, in order to maximize the deep coverage along line considering that the majority of the seismic events are coming from North and East (e.g. Japan, and Pacific Ocean) and few are arriving from South and West (Africa and Atlantic Ocean). In this work we show the results obtained employing the teleseismic traces recorded at the stations, and the images of the Earth’s outermost layers below the Eastern Alps.

Seismic events occurring far away from the recording stations are hitting the subsurface at an almost vertical angle; this characteristic is the ground for the construction of the receiver functions (RF) time series; the vertical record is indeed the expression of the source and instrument contribution, and can be deconvolved from the horizonthal components, resulting in the near-receiver structure response. Thus the RFs are made of positive and negative phases generated at impedance contrasts (and their multiples), rendering the occurrence of structural discontinuities at depth.

Here we present the results concerning the depth of the Moho and other interfaces, velocity structure and Vp/Vs, imaged with the use of different approaches – depth migrated receiver functions along with manual time picks converted into interface depths, H-k method (Zhu & Kanamori, 2000), harmonic analysis – together with an estimate of their reliability.

Results are showing a sharp Moho beneath the Bohemian Massif until the Bavarian Shear Zone, deepening towards south. On the other hand, the Adriatic Moho deepens from south to north towards the Tauern Window. At the boundary between the two plates, the whole crustal structure looks complex, holding several Ps converted phases, and we observe a 20 km thick velocity-gradient zone between crust and mantle. Moreover we isolate the signal generated by inclined interfaces and anisotropy through the application of the harmonics decomposition of the RFs. At finer crustal scale, the presence of anisotropy is related to the underthrusting of the crystalline basement and syn-orogenic sediments.