Anisotropy Beneath the Eastern Alps: Shear-Wave Splitting from Permanent Stations

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The Alpine belt is divided into the arc of the Western Alps and the E-trending Eastern Alps. Surface geology shows clear differences in geological structure and evolution, e.g. the involvement of paleogeographic units belonging to the European (mainly present in the western Alps) and Adriatic (mainly in the eastern Alps) domain. There are major open questions as to the behavior of the two (European and Adriatic) plates at lithospheric scale, and the nature and polarity of the subduction.

Since deformation, e.g. that associated with the long-term convergence between the European and Adriatic plates (also some microplates), generally leads to alignment of minerals, seismic anisotropy can help to constrain deformation at depth, and perhaps to resolve some of the open questions.

This study uses SKS/SKKS shear wave splitting, to focus on upper mantle anisotropy under the Eastern Alps, with the aim of inferring deformation in the crust and upper mantle under the Alps. Shear wave splitting parameters from 12 permanent stations of the Austrian Seismic Network (OE), located geographically in the central and eastern Alps, have been measured using the SplitLab package (Wüstefeld & Bokelmann, 2007). The two splitting parameters, fast direction azimuth (Φ) and arrival time delay between fast and slow phases (δt) have been defined for the first time in this area, giving stable results thanks to the long recording time of the seismic stations.

The shear wave splitting results show good agreement with previous studies in the central Alps where the direction of the fast anisotropy axis is NE trending. Fast directions in the eastern Alps show an ESE trend. There is a clear pattern of seismic anisotropy under the Alps, with a remarkable rotation of fast orientation along the Alpine chain. The rotation rate is particularly prominent in all of the Western Alps as well as the Tauern Window in the Eastern part of the Alps.