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Tomography image of double high-velocity heterogeneity beneath the Eastern Alps from the AlpArray data

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Convergence between the European and African plates formed the Alps and the neighbouring mountain belts. We present results based on teleseismic body-wave data from the AlpArray-EASI complementary experiment (2014-2015, Hetényi et al., Tectonophysics 2018) and the AlpArray Seismic Network (Hetényi et al., Surv. Geophys. 2018). Tomography of seismic velocities in the upper mantle, as well as seismic anisotropy study along a ca. 200 km broad and 540 km long north-south transect (crossing the Bohemian Massif in the north, the East-Alpine root, and reaching the Adriatic Sea in the south), image the steeply northward dipping East-Alpine root, dominated by the Adriatic plate, steady southward thickening of the lithosphere beneath the Bohemian Massif and distinct regional variations of mantle lithosphere fabrics modelled in 3D. These characteristics imply complex, domain-like architecture of the collisional zone of the European/Adriatic plates beneath the Alps. Thanks to the close spacing of the AlpArray stations and high-quality data, the high-resolution tomography resolved for the first time two neighbouring high-velocity northward-dipping heterogeneities beneath the Eastern Alps, instead of one thick root of the lithosphere. The southern one, which we relate to the Adriatic plate, is more distinct, the northern one is less pronounced, it delaminates at ~100km depth and diminishes in direction toward the Central Alps. It may represent a remnant of an early phase subduction of the European plate with the switched polarity (relative to the polarity in the Western Alps), or a preceding phase of the Adriatic subduction.