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Imaging the slab structure in the Alpine region by high-resolution P-wave tomography

Stéphane Guillot (1), Liang Zhao (2), Anne Paul (1), Marco G. Malusà (3), Xiaobing Xu (2), Tianyu Zheng (2), stefano Solarino (4), Stéphane Schwartz (1), Thierry Dumont (1), Simone Salimbeni (4), Coralie Aubert (1), Silvia Pondrelli (4), Qingchen Wang (2), and Rixiang Zhu (2)

(1) University of Grenoble Alpes, ISTerre, Grenoble, France (stephane.guillot@univ-grenoble-alpes.fr), (2) Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China, (3) University of Milano-Bicocca, Milan, Italy, (4) Istituto Nazionale di Geofisica e Vulcanologia, Genoa and Bologna, Italy

Based upon a finite-frequency inversion of traveltimes, we computed a new high-resolution tomography model using P-wave data from 527 broadband seismic stations, both from permanent networks and temporary experiments (Zhao et al., 2016). This model provides an improved image of the slab structure in the Alpine region, and fundamental pin-points for the analysis of Cenozoic magmatism, (U)HP metamorphism and Alpine topography. Our results document the lateral continuity of the European slab from the Western to the Central Alps, and the down-dip slab continuity beneath the Central Alps, ruling out the hypothesis of slab breakoff to explain Cenozoic Alpine magmatism. A low velocity anomaly is observed in the upper mantle beneath the core of the Western Alps, pointing to dynamic topography effects (Malusà et al., this meeting). A NE-dipping Adriatic slab, consistent with Dinaric subduction, is possibly observed beneath the Eastern Alps, whereas the laterally continuous Adriatic slab of the Northern Apennines shows major gaps at the boundary with the Southern Apennines, and becomes near vertical in the Alps-Apennines transition zone. Tear faults accommodating opposite-dipping subductions during Alpine convergence may represent reactivated lithospheric faults inherited from Tethyan extension. Our results suggest that the interpretations of previous tomography results that include successive slab breakoffs along the Alpine-Zagros-Himalaya orogenic belt might be proficiently reconsidered.

Malusà M.G. et alii (2017) On the potential asthenospheric linkage between Apenninic slab rollback and Alpine topographic uplift: insights from P wave tomography and seismic anisotropy analysis. EGU 2017.

Zhao L. et alii (2016), Continuity of the Alpine slab unraveled by high-resolution P wave tomography. J. Geophys. Res., doi:10.1002/2016JB013310.