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Local earthquake tomography in the junction domain between Southeastern Alps and Dinarides using the seismic data of the CE3RN

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The collision zone between Southeastern Alps and External Dinarides has always been interested by medium-high seismicity characterized by a complex tectonic system that suggests the overlap of a mixture of geological domains.
During the last twenty years, several geological studies and geophysical investigations were carried out to understand the existing relationships between different geological formations and the properties of the upper crust. In this work, we perform a study of Local Earthquake Tomography (LET) using 180 events occurred between 2004 and 2014 available by the transfrontier network CE3RN, ensuring a good coverage even in zones marked by national boundaries.
We combined the travel time tomography with the earthquake location in an iterative procedure. To locate seismic events, we used the algorithm NLLoc (Non Linear Location, Lomax et al., 2009), while tomographic inversion has been performed using the Cat3D software (Computer Aided Tomography for 3-D models), which estimates the velocity from travel times by using the SIRT method (Simultaneous Iterative Recursive Technique), and the staggered grid technique, by which the resolution of the tomographic images increases without losing the reliability of the results. As initial velocity structure, we started from a simplified version of the 1-D reference model proposed by Costa et al. (1992) modified in the first layers to include the Friuli plain, using geological information (Slejko et al., 1987, Ponton, 2010).
The reliability of the tomographic system was assessed through the residual analysis, the ray density map, the null space map and the checkerboard test.
Results suggest the presence of a high P-wave velocity zone from 4 to 12 km in the External Dinarides, while in the Friuli Venezia Giulia region, the heterogeneous distribution of velocities reflects the complex tectonic system of the area.
In N-S direction our obtained model shows a high P velocity body, which could match the thrust zone between Paleozoic bedrock and Triassic dolomites. Also in W-E direction, a high velocity body may be related to the Paleozoic bedrock and the intrusions within the most recent geological formations.
The obtained results are in agreement with other geophysical studies already performed, in particular respect to the existence of a body with P values around 7 km/s beneath Central Friuli at a depth between 4 and 8 km, probably connected to the region of 1976 Friuli earthquake.