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New insights into the kinematics and seismotectonics of the Adria-Eurasia boundary in the eastern Alps from geodetic and seismic data

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In this work we describe a new kinematic and seismotectonic model of the eastern Alps, at the boundary between Italy, Austria, Slovenia and Croatia, obtained from the analysis of geodetic (GPS) and seismological data. We use a dense GPS velocity field, obtained from integration of continuous, semi-continuous and survey-mode networks ($\sim$200 GPS stations between longitude 10°E and 17°E and latitude 44.5°N and 47.5°N) and an updated seismic and focal mechanisms catalogue, with uniformly calibrated moment magnitudes from $\sim$1000 B.C.. Improved accuracies and precisions of GPS motion rates have been obtained by filtering displacement time-series for the spatially correlated common mode errors. The eastern Alps mark the boundary between the Adriatic microplate and the Eurasian plate through a wide zone of distributed deformation. Geodetic deformation and seismic release are more localized, and characterized by larger earthquakes, along the southeastern Alps fold-and-thrust belt, which accommodates the large part of the $\sim$N-S Adria-Eurasia convergence, and in Slovenia, where a transition from $\sim$N-S shortening to the eastward escape of the Pannonian Basin units occurs through a complex pattern of crustal deformation. GPS velocities well describe the overall kinematics, with a transition from NNW-ward to NE-ward motion trends (in a Eurasian frame) across Slovenia and Austria, but also show small but significant crustal deformation far from the major blocks boundaries. This may suggest internal continuous deformation or a more complex configuration of interacting tectonic blocks in the eastern Alps. This second hypothesis is taken into account and tested in this work. We use seismic moment release rate maps, active faults databases and inspections of GPS velocities in different local frames to define the geometry of a kinematic block model, constrained by GPS horizontal velocities, in order to estimate blocks rotations and elastic strain at blocks bounding faults. The improved GPS velocity field highlights significant strain accumulation off the main thrust fault segments in the southeastern Alps, in regions stroke by large (M>6.5) historical earthquakes (e.g., the 1117 Verona and the 1695 Asolo events). This is evident in the Venetian plain, where GPS highlights significant shortening in areas that are tens of km southward of the south Alpine mountain front. In the Italian southeastern Alps results from the block model, constrained by a denser GPS velocity field (e.g., around the Montello fault), put new lights on i) the way the Adria-Eurasia convergence is partitioned across the southeast Alpine mountain range, ii) about interseismic coupling along the main thrust faults and iii) the way N-S shortening is transferred, through right-lateral shear across the Dinaric system, to shortening across the Sava folds in Slovenia. In the end, a comparison of the estimated seismic moment release rates and the seismic moment accumulation rates, estimated from the model velocities, provide new insights into the seismic potential of the study region.