EGU General Assembly 2020

EGU2020-11814
https://doi.org/10.5194/egusphere-egu2020-11814
EGU General Assembly 2020

Structural Complexity and Mechanics of a shallow crustal Seismogenic Source (Vado di Corno Fault Zone, Italy)

Michele Fondriest[1], Fabrizio Balsamo[2], Andrea Bistacchi[3], Luca Clemenzi[2], Matteo Demurtas[4], Fabrizio Storti[2], and Giulio Di Toro[5]
[1]IsTerre, Universitè Greonoble Alpes (michelefondriest@yahoo.it)
[2]Università degli Studi di Parma
[3]Università degli Studi Milano Bicocca
[4]University of Oslo
[5]Università degli Studi di Padova

The mechanics and seismogenic behaviour of fault zones are strongly influenced by their internal structure, intended as three-dimensional geometry and topology of the fault/fracture network and distribution of the fault zone rocks with related physical properties. In this perspective, the internal structure of the extensional seismically active Vado di Corno Fault Zone (Central Apennines, Italy) was quantified by combining high-resolution structural mapping with modern techniques of 3D fault network modelling over □2 km along fault strike. The fault zone is hosted in carbonate host rocks, was exhumed from □2 km depth, accommodated a normal slip of □1.5-2 km since Early-Pleistocene and cuts through the Pliocene Omo Morto Thrust Zone that was partially reactivated in extension.

The exceptional exposure of the Vado di Corno Fault Zone footwall block allowed us to reconstruct with extreme detail the geometry of the older Omo Morto Thrust Zone and quantify the spatial arrangement of master and subsidiary faults, and fault zone rocks within the Vado di Corno Fault Zone. The combined analysis of the structural map and of a realistic 3D fault network model with kinematic, topological and slip tendency analyses, pointed out the crucial role of the older Omo Morto Thrust Zone geometry (i.e. the occurrence and position of lateral ramps) in controlling the along-strike segmentation and slip distribution of the active Vado di Corno normal fault zone. These findings were tested with a boundary element mechanical model that highlights the effect of inherited compressional features on the Vado di Corno Fault Zone internal structure and returns distributions and particularly partitioning of slip comparable with those measured in the field.

Lastly, we discuss the exhumed Vado di Corno Fault Zone as an analogue for the shallow structure of many seismic sources in the Central Apennines. The mechanical interaction of the inherited Omo Morto Thrust Zone and the extensional Vado di Corno Fault Zone generated along-strike and down-dip geometrical asperities. Similar settings could play first-order control on the complex spatio-temporal evolution and rupture heterogeneity of earthquakes in the region (e.g. 2009 Mw

6.1 L’Aquila earthquake).