Comparing coseismic slip with mid- and long-term displacement on the Mt. Vettore- Mt. Bove fault system after the 2016 Central Italy earthquakes: insights into growth and segmentation processes of an active extensional system

Irene Puliti*[1], Alberto Pizzi[1], Lucilla Benedetti[2], Alessandra Di Domenica[1], and Pietro Paolo Pierantoni[3]

[1]Università degli Studi 'G. d'Annunzio' di Chieti-Pescara, InGeo, Chieti (Italy) – Italy
[2]Aix-Marseille Université, CEREGE CNRS-IRD UMR 34, Aix-en-Provence (France) – CNRS : UMR34 – France
[3]Università degli Studi di Camerino, Camerino (Italy) – Italy

Abstract

We present an integrated study of the morphotectonic and structural geology of the Mt. Vettore - Mt. Bove Faults System (VBFS) in the central Apennines aiming at better understanding its evolution and growth over time.
In Aug-Oct 2016, this fault system broke during three earthquakes (M6.0, M5.9, and M6.5) associated with clear coseismic ruptures.

We investigated the VBFS at three different time scales: long-term, geological (10-10 yr); mid-term, morphological (_˜ last 20 kyr, i.e. post-LGM); short-term (actually coseismic).

The cumulative offset on each segment is assessed by high-resolution DEM (50 cm) topographic profiles. Geological cross-sections are used to understand the long-term behaviour of the VBFS and the role played by inherited structures on Quaternary fault segmentation. We compare the slip distribution of the 2016 coseismic surface rupture with both the morphological throw and the geological down-throw. This comparison shows that faults can be distinguished in three types: 1- faults with coseismic rupture associated with mid-term morphological displacement and large, i.e.> 100 m, geological down-throw; 2- faults with coseismic rupture but not usually recognised in the available geological maps; 3- faults with large geological down-throw and slight-to-no morphological offset that did not break during the 2016 seismic events.

Moreover, based on our geological and geomorphological profiles we identify three zones of possible segments' boundary with low or no displacement, also associated with no obvious surface faulting during the 2016 seismic events. We strengthen this dataset by the analysis of topographical swath profiles performed along the hanging-wall and the footwall of the fault system. The footwall profile exhibits sectors characterised with topographic lows deviating

*Speaker

from the characteristic bell-shape of a growing fault.

Our results confirm that the short-term pattern of coseismic ruptures fits well with the mid-term morphological one, and is also partially compatible with the location of the geological longer term offsets on faults.

In terms of seismic hazard assessment, we infer that fault segments showing evidence of activity over the last 20 kyr might represent the segments that are the most prone to break soon and the ones that will produce coseismic surface faulting in geological and geomorphological settings similar to our case-study.