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Roughness evaluation on a splay of the active fault system responsible of the massive 2016 seismic sequence of Central Apennines (Italy)

Amerigo Corradetti[1], Stefano Tavani[2], Miller Zambrano[3], Emanuele Tondi[3], and Thomas Seers[1]
[1]Texas A&M University at Qatar, Doha, Qatar (amerigo.corradetti@qatar.tamu.edu)
[2]Università di Napoli Federico II, Naples, Italy
[3]Università di Camerino, Camerino, Italy

Fault roughness is a general term used to indicate dimension and distribution of fault asperities. Due to the role that fault asperities play on slip dynamics and frictional behavior during the seismic cycle, fault roughness constitutes a key element to understand earthquakes nucleation. Since it is not possible to recover fault roughness from seismogenic sources, faults at surface are generally used as analogues. However, those faults are in most cases subject to weathering and their roughness can lose seismogenic representativeness. Active faults episodically expose “fresh” fault zones constituting the best targets for seismogenic roughness evaluations.

Here we present the study conducted on a splay of the Mt. Vettore fault system in the Central Apennines (Italy), along a vertical transect that includes both a weathered and a freshly exposed portion of the fault. The latter was exposed after the dramatic Mw 6.5 shock that hit the area on the 30th of October 2016. We produced a high detailed model of a part of the fault by means of structure from motion-multiview stereo (SfM-MVS) photogrammetry to assess its roughness parameters and to determine how these are affected by weathering.

Our results show that weathering increases the value of the fractal parameters. Accordingly, we conclude that using high resolution point clouds it is possible to recognize patches of fault having similar exposition time to weathering.