Geophysical Research Abstracts
Vol. 12, EGU2010-12775-1, 2010
EGU General Assembly 2010

Long-term expression of the Paganica Fault vs. 2009 L'Aquila Earthquake surface ruptures: looking for a better understanding of its seismic behavior

Riccardo Civico (1), Stefano Pucci (1), Paolo Marco De Martini (1), Daniela Pantosti (1), Francesca Romana Cinti (1), Simona Pierdominici (1), Luigi Cucci (1), Paola Del Carlo (2), Carlo Alberto Brunori (1), Antonio Patera (1), and Stefania Pinzi (1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Seismology and Tectonophysics, Rome, Italy (riccardo.civico@ingv.it), (2) Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Italy

The Mw6.3, April 6, 2009 earthquake occurred on the previously identified Paganica normal fault and produced a 3 km-long co-seismic surface rupture along its northern section, with few centimeters of vertical displacement. Extensive 1:10,000-scale geological and geomorphological mapping has been carried out, focusing on the characterization of the long-term expression of the Paganica Fault at the surface. The field mapping was integrated by observations, made on 1:33,000 scale aerial photographs (GAI), 5-m-resolution Digital Elevation Model and standard morphometric derivatives (hill-shaded and slope angle maps, Spatial Analyst™). Particular attention was devoted to the study of the continental deposits and landforms affected by cumulative offset with the aim to reconstruct the Quaternary deformational history of the fault. The fault runs for a total length of 20 km and, along with antithetic faults on its hanging-wall, forms the graben of the Middle Aterno River Valley. The whole fault system and the variable setting of deformation affecting the continental deposits at the surface were identified. The Paganica long-term morphologic signature is represented by a set of prominent scarps formed by the tectonic juxtaposition of late Pliocene-middle Pleistocene and late Pleistocene alluvial deposits, and by lower scarps in late Pleistocene-Holocene deposits. In addition, evident Quaternary erosional and depositional paleosurfaces were recognized and sampled for 14C and OSL (Optically Stimulated Luminescence) and tephra chronology dating for long-term slip-rate calculations.

This study resulted helpful to locate four paleoseismological investigations (see Pantosti et al. talk) and to provide the appropriate context for correctly interpret the depositional bodies outcropping on the trench walls. These paleoseismological investigations evidenced the presence of repeated late Pleistocene-Holocene activity and allowed for slip-rate estimation at a shorter time-scale. Such estimates were valuable for a comparison with the preliminary estimates on late Pleistocene calculations carried out by geomorphological investigations.

Moreover, we correlated co-seismic deformations with the long-term morphologies and structures. The 2009 co-seismic ruptures show a general coherence with the long-term Paganica fault trace, both in terms of location and style. However, the limited extent of the 2009 surface ruptures coincides with the portion of the fault trace where deformation is more localized and few splays contribute to the extension. This is also testified by the presence on its hanging-wall of a large late Pleistocene-Holocene alluvial fan that subsides over the basin depocenter. Conversely, where the Paganica fault system branches out, various splays accommodated the small 2009 co-seismic throw, resulting in a distributed and not evident extensional strain.

The preserved fault-related geomorphology is evidence for the persistence of the rupture complexities during Quaternary. On this light, further studies on the style of fault activity are needed to estimate if the Paganica fault is capable of earthquakes with Magnitude larger than the 2009 event.