

Active faulting Vs other surface displacing complex geomorphic phenomena. Case studies from a tectonically active area, Abruzzi Region, central Apennines, Italy

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How can be univocally inferred the genesis of a linear surface scarp as the result of an active and capable fault (FAC) in tectonically active regions? Or, conversely, how it is possible to exclude that a scarp is the result of a capable fault activation?

Trying to unravel this open questions, we show two ambiguous case studies about the problem of the identification of active and capable faults in a tectonically active area just based on the presence of supposed fault scarps at surface. The selected cases are located in the area comprised between the Middle Aterno Valley Fault (MAVF) and the Campo Imperatore Plain (Abruzzi Region, central Apennines), nearby the epicentral area of the April 6th, 2009 L'Aquila earthquake. In particular, the two case studies analysed are located in a region characterized by a widespread Quaternary faults and by several linear scarps: the case studies of (i) Prata D'Ansidonia area and (ii) Santo Stefano di Sessanio area. To assess the origin and the state of activity of the investigated geomorphic features, we applied a classical geological and geomorphological approach, based on the analysis of the available literature, the interpretation of the aerial photographs, field surveying and classical paleoseismological approach, the latter consisting in digging excavations across the analysed scarps. These analysis were then integrated by morphometrical analyses.

As for case (i), we focused on determining the geomorphic “meaning” of linear scarps carved onto fluvial-deltaic conglomerates (dated to the Early Pleistocene; Bertini and Bosi, 1993), up to 3 meters high and up to 1,5 km long, that border a narrow, elongated and flat-bottom depressions, filled by colluvial deposits. These features groove the paleo-landsurface of Valle Daria (Bosi and Bertini, 1970), wide landsurface located between Barisciano and Prata D'Ansidonia. Entwining paleoseismological trenching with geophysical analyses (GPR, ERT and microgravimetrical prospections), it could be possible to infer the genesis of the scarps as due to complex tectono-karstic phenomena.

As for case (ii), our ongoing analyses are aimed to analyze the tectonic “significance” of some closed depressions, up to 4 km long and to 0,5-1 km large, that occur along the south-western slope of the Gran Sasso Range. All these small depression are NW-SE trending. As already described by Bosi et al. (1989), Galadini and Giuliani (1993), D'Agostino et al. (1998), Falcucci et al. (2015), these closed depressions are bounded by scarps carved onto the carbonate bedrock and, subordinately, onto early Quaternary slope deposits, reaching height of up to 5 m. These scarps are preferentially NE dipping, even if in few cases some SW dipping scarp are also present. The field work has permitted to attest that these scarps are related to shear planes that that displaced two subsequent of Early Pleistocene breccias formations (the Valle Valiano Fm. and Fonte Vedice Fm.; Bosi e Bertini, 1993; D'agostino et al., 1997). A paleoseismological trench was also performed across one of these scarps, attesting the activity of these shear planes also in recent times, providing indications result about the deformation style.

Reference

Bertini, T., & Bosi, C. (1993). La tettonica quaternaria della conca di Fossa (L'Aquila). *Il Quaternario*, 6(2), 293-314.

Bertini, T., Bosi, C., & Galadini, F. (1989). La conca di Fossa-S. Demetrio dei Vestini. CNR, Centro di Studio per la Geologia Tecnica, ENEA, PAS in Elementi di tettonica pliocenicoquaternaria ed indizi di sismicità olocenica nell'Appennino laziale-abruzzese, Società Geologica Italiana, L'Aquila, 26-58.

Bosi, C., & Bertini, T. (1970). Geologia della media valle dell'Aterno. Memorie Società Geologica Italiana, 9(4), 719-777.

D'Agostino, N., F. Speranza, & R. Funicello., (1997) "Le Breccie Mortadella dell'Appennino Centrale: primi risultati di stratigrafia magnetica." *Il Quaternario* 10.2: 385-388.

D'Agostino, N., Chamot-Rooke, N., Funicello, R., Jolivet, L. & Speranza, F., (1998). The role of pre-existing thrust faults and topography on the styles of extension in the Gran Sasso range (central Italy). *Tectonophysics* 292, 229-254.

Falucci, E., Gori, S., Moro, M., Fubelli, G., Saroli, M., Chiarabba, C., & Galadini, F. (2015). Deep reaching versus vertically restricted Quaternary normal faults: Implications on seismic potential assessment in tectonically active regions: Lessons from the middle Aterno valley fault system, central Italy. *Tectonophysics*, 651, 186-198.

Galadini, F. & Giuliani R. (1993), Role of the structural geology analysis in the recent tectonics studies: an example from an area located SW of the Gran Sasso (Central Italy). *Ann. Geof.*, 36 (1), 287-292.