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MORPHOSTRUCTURAL ANALYSIS OF AN ACTIVE FAULT IN THE SILA MASSIF (CALABRIA, SOUTHERN ITALY): IMPLICATION FOR SEISMIC HAZARD AND RECENT EVOLUTION OF THE AREA

The Sila Grande Massif (SGM), in the northern sector of the Calabrian Arc, consists of a thrust-pile of metamorphic and non-metamorphic Paleozoic rocks (Fig. 1). The most representative tectonics structures of this area are NW-trending high angle faults, characterized by oblique transpressive and transtensional cinematics, which acted since middle Miocene (Van Dijk et al., 2000). Regionally, the definition of their activity was derived from the evolution of complex basin-margins, along which transtensional and transpressional faulting dominated (i.e. the Crotone Basin; Van Dijk, 1994).

Fig. 1 - Geological sketch map of the northern sector of the Calabrian Arc (modified from Van Dijk et al., 2000).

Amongst these faults, the NW-SE Petilia-S.Sosti Fault (Van Dijk et al., 2000) extends roughly from the Crati Valley, to the northwest, to the Crotone Basin, to the southeast, cutting through the SGM and affecting the boundary between the high grade metamorphic rocks of the Polia Copanello Unit, and the Sila batholith. The
central portion of the structure fits partly with a 26-km long, N130° fault identified by Galli and Bosi (2003; Lakes fault); paleoseismological analyses ascertained that this fault was responsible for the Mw = 6.7, June 1638 earthquake, and for several paleoseismic events in the past thousands years.

Besides these studies, the quaternary activity of the NW trending faults in the SGM is testified by the fact that they affect the remnants of a mature erosion landscape, consisting of well-developed, smoothed landforms (1st Order Paleosurface) (Dramis et al., 1990). The Paleosurface characterize the highest landscape of the Sila Massif: well examples of this morphostructural features are found close to the Cecita Lake.

In order to investigate the recent tectonic evolution of the SGM, a structural approach was carried out. It was based on the analysis of the youngest brittle deformations along the structures with the most recent morphologic expression. The data collected do not account for pre-Pleistocene deformation, but they are focused along the fault planes that exhibit a very recent character of reactivation.

A complex fault array architecture characterize the Lakes fault zone, constituted by at least two principal NW trending segments 10-km long.

In some areas the trend of the main faults bent in NNW-SSE trending directions. These sectors represent constraining bend associated with push-up structures (Galli and Bosi, 2003), 3 m to 25 m high, being possibly related to local compressive zones along strike-slip faults.

We carried out a transect analysis of the fault-array along a NW-SE trending direction. This method can be used to compare the trends of the macro faults in respect to the meso-faults collected in the structural surveys. The results evidenced a good fit of fault orientation at various scales (macro and meso faults), and allowed us to evaluate the different fault trend in the different areas of the array.

The data collected in the central sector of the array (Cagno basin) evidence that this sector is characterized by a complex fault pattern, constituted by E-W horsetail structures related to the end of the primary faults.

In the whole, the structural data and the architecture of the array show a complex cinematic evolution of the Lakes fault. The collected measurements are represented by NW-SE trending faults with different kinematics.

The different pattern of striae founded in the planes of the same system, testify the polyphasic activity of this structure. In fact, the left lateral transpressive meso faults are widespread mainly in the constraining bend of the main fault plane; meanwhile, meso-faults with oblique and normal kinematic characterize more largely the fault segments array.

As far as the current activity of the fault (i.e., Holocene), the fault planes depicted by the paleoseismological analyses carried out in 2-4 m-deep trenches on the flank of push-up structures (Galli and Bosi, 2003; Galli et al., 2004) had an apparent geometry of dip slip normal fault, characterized by left-lateral oblique striae.

The former trench investigations showed a recent activity for various zone of the entire array; in this context, the central zone (Cagno basin) is a fault zone characterized by a soft-hard linkage interaction between two 10 km segments.

Besides, the chronology of the deformation events in the area, and the structural characterization of the fault, this work allowed us to get more information about the recent structural evolution of this sector of the SGM, and to evaluate the interference and kinematics compatibility with other recent fault systems in the northern Calabria.
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