ACTIVE LANDSCAPE RESPONSE TO HALF-ELLIPTICAL TECTONIC DEFORMATION: SOUTHEASTERN HYBLEAN PLATEAU (SE-SICILY, ITALY)

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The recognition of active faults within a regional-scale fault belt represents a crucial challenge to define active crustal deformation and to outline the strain partitioning processes. As demonstrated by several studies in the last decades, the geomorphic features of a landscape represent the surficial expression of the relief-building endogenous processes, enabling to define the tectonic deformation distribution, the fault activity and its geometry, contributing significantly to the general seismic and hydrogeological risk assessment of a region.

The present study provides geomorphic evidences of active landscape response to tectonic disturbance along the southeastern border of the Hyblean Plateau (SE-Sicily - Italy) (Fig. 1). This latter is located at the African-European convergent plate boundary and it was affected by high-level historical seismicity (e.g. 1693 seismic event - Postpischl, 1985; Boschi *et al*., 1995). The Hyblean region is composed of distinct Quaternary crustal blocks (Catalano *et al*., 2010) that derive from the fragmentation of the Late Miocene-Pliocene foreland bulge of the Sicilian orogenic belt (Ben Avraham et al., 1990). During the Quaternary, the low-amplitude flexuring of the Hyblean continental crust related to the NNW-SSE oriented Nubia-Eurasia convergence, determined the development of NE-SW-oriented extensional faulting (e.g. Scordia-Lentini Basin; S.L.B. in Fig. 1), accommodated along a regional N10-oriented, right-lateral transform fault zone (Scicli Line; S.L. in Fig. 1) (Ghisetti and Vezzani, 1980; Catalano *et al*., 2008). Since the Middle Pleistocene (<850 ka), a generalised positive tectonic inversion caused the remobilisation of these main fault systems, resulting in the progressive NW-ward migration and emergence of the eastern sectors of the Hyblean Plateau (Fig. 1) (Catalano *et al*., 2010). This Late Quaternary mobile crustal block is bounded, to the northwest by the inverted border faults of the Scordia-Lentini Basin (e.g. Pedagaggi-Agnone System; Fig. 1), to the northeast by the active dextral faults in the Ionian off-shore (Bianca *et al*., 1999; Polonia *et al*., 2011) and to the west by the inverted left-lateral Scicli Line (Fig. 1). At the southeastern counterpart the Hyblean kinematic block is controlled by the NE-SW oriented Ispica Fault (I.F. in Fig. 1) and Avola Fault (Catalano et al., 2008), this latter representing our study area.

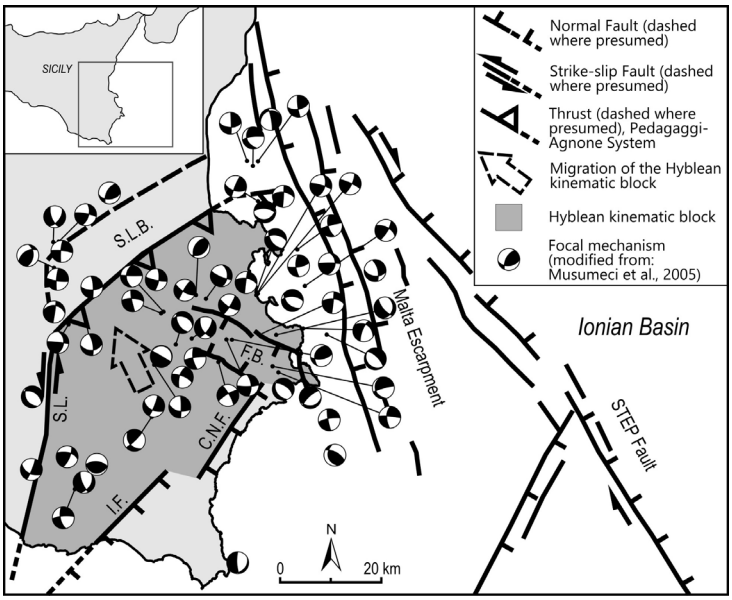

Fig. 1 - Kinematic model and seismotectonic picture of the Hyblean Plateau and the western Ionian region. The main fault belts and focal mechanisms of the main medium to low magnitude earthquakes that affected the region (modified from Musumeci *et al*., 2005) are reported (S.L.: Scicli Line; S.L.B.: Scordia-Lentini basin; F.B.: Floridia Basin; S.L.: Scicli Line; I.F.: Ispica Fault; C.N.F.: Cassibile-Noto Fault). The shaded dark grey area indicate the eastern Hyblean Plateau kinematic block.

In the present study, we carry out a morphometric investigation of the tectonically-controlled southeastern margin of the Hyblean Plateau by performing fluvial network and relief analyses and marine terraces age modelling. We employ different geomorphic indices (e.g. hypsometric integral, topographic relief, topographic dissection, SLindex, k_{sn}, Vf), combined with long-profile analysis, topographic swath profiles, field-based geomorphological survey and meso-scale structural analysis.

As main results, our analysis provides: i) a numerical characterization and age definition of the active landscape response to active half-elliptical crustal deformation; ii) the updating of the geometry and deformation rates of the recent and active tectonic belt that controls the southeastern margin of the Hyblean Plateau; iii) the seismogenic potential of the recognised 20km-long, NNE-trending bounding structure.

In particular, our results evidence a deformation rate increase along the investigated tectonic belt since the last 240-200 ka, passing from about 0.6 mm/a to about 1.10 mm/a. In the frame of the geodynamic picture of the region, our results enable to define the tectonic control along the southern margin of an actively NW-ward moving crustal block within the fragmented Hyblean Plateau domain, as also documented by geodetic data (Bonforte *et al*., 2015; Chiarabba and Palano, 2017; Vollrath *et al*., 2017) and seismological data (Musumeci *et al*., 2005). The recognised fault belt (here named Cassibile-Noto Fault, C.N.F. in Fig. 1), together with the Ispica Fault located more to the southwest, would represent a potential seismogenic source that is accommodating at rear the amounts of shortening absorbed along the opposite inverted northwestern margin (i.e. Pedagaggi-Agnone System; Fig. 1) of the Hyblean crustal block.

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