



Strain on Africa-Europa boundary in the northern Hyblean plateau margin (SE-Sicily) from GPS and geological data

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The Hyblean Plateau occupies the southeast corner of Sicily east of Gela and south of Catania. It forms a peneplain, just 30 km south of M. Etna and characteristic steep valleys form small canyons and gorges. The Hyblean Plateau forms a tectonically stable block at the northern edge of the of the African Plate, not affected by folding or underthrusting below the Eurasian Plate. The plateau is separated from the Gela Nappe to the northwest by Gela-Catania foredeep, filled with Quaternary and Recent sediments overlying upper Pliocene to lower Pleistocene volcanics. The Gela Nappe, a Plio-Pleistocene thrust wedge (Butler et al., 1982), represent the external front of the Maghrebian thrust belt. This thrust belt was generated by continental collision between the northern edge of the African Plate (the Hyblean Plateau) and the Calabrian Arc which lies on the north-eastern tip of Sicily, but is largely submerged offshore northern Sicily (southern Tyrrhenian Sea). We investigate the northern margin of the Hyblean plateau by joining geological and geodetic (GPS) data. Carbonate and marly deposits and volcanics, of Late Miocene - early Pleistocene age outcrop in the area. This geological setting is due to a complex interplay of subaerial and submarine volcanism, subsidence an uplift and eustatic sea level changes. The area is affected by normal faults trending NE-SW that identify lower morphological areas (Scordia-Lentini Graben and Catania Trough) filled by lower Pleistocene clays and the Primosole- Serravalle horst, where the volcanic substrata and the overlapped carbonates outcrop. GPS surveys were performed since 1991 on the epicentral area of

the December 13 1990 earthquake, across the Scordia-Lentini graben, with the aim of detecting near field deformation related with this tectonic structure (Achilli et al., 1995). Since then, GPS network was extended on the entire eastern part of the Hyblean foreland and of the Catania-Gela foredeep. In 1998 and 2000, two GPS surveys were carried out and 26 stations of the northern part of network (between the towns of Siracusa and Catania) were occupied (Bonforte et al., 2002). GPS measurements were carried out again on October 14 and 15 2005, during the “EUROSOT 2005” Civil Defence seismic emergency simulation, on 15 stations of the network measured during the 1998 and 2000 surveys. After this small survey, new benchmarks were installed, to improve the network. Just after the network improvement was completed, from March 1 to 9, 2006, a new survey was carried out, re-measuring the stations surveyed in 2005, those surveyed also in 1998 and 2000 and all the new benchmarks. Horizontal ground deformation resulting by comparing the last survey to the previous ones, evidences a convergence between the northern and southern boundary of the network with a roughly NW-ward motion of the southern stations and a roughly SW-ward motion of the northern ones (about 1-2 mm/y). The vertical deformation shows an evident active subsidence of the Scordia-Lentini graben in the order of -2 mm/y, in contrast with the uplift (about 2-3 mm/y) of the central part of the Hyblean plateau and the Primosole-Serravalle area. 2D strain tensor analysis, performed on a regular grid over the area, evidenced a compressive strain, with a main N-S contraction, acting North of the Scordia-Lentini graben, while a slight NW-SE extension seems to affect the central part of the plateau. The geological and geodetic data suggest that the area represents a segment of the foredeep-foreland system in which the subsidence of the external sector of the foreland, started in the late Pliocene times (Torelli et al. 1998) is still active; this process produces an uplift on the area adjacent to the subduction (Primosole-Serravalle) and on the internal part of the plateau, due to elastic deformation of the crust; conversely, the intermediated zone (Scordia-Lentini graben) is affected by extensional processes due to the flexure, forming subsiding areas.

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