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Geological hazard in the central Mediterranean area

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The present-day tectonic framework of the central Mediterranean area is the result of the Neogene-Quaternary geodynamic processes related to the ca. N-S Africa-Europe convergence. This area is currently affected by large earthquakes and by local volcanic activity, mostly related to extensional or oblique-slip tectonics. The main regional feature in the area is a prominent fault belt that runs more or less continuously for a length of about 200km from the central sector of the Aeolian archipelago (Aeolian-Tindari fault system), along the Mount Etna coastline as far as the Hyblean-Malta offshore (Alfeo–Etna and Malta Escarpment fault systems), connecting southwards with the Sicily Channel rift systems. It has been interpreted as a transfer zone separating two main lithospheric domains characterised by different stress regimes. In fact, both seismological and geodetic data confirm the occurrence of a contractional domain in the North-western offshore of Sicily and along the Sicilian chain front, related with the Africa-Europe convergence, and the occurrence of a extensional domain in North-eastern Sicily and southern Calabria, related to back-arc stretching linked to the Ionian subduction process.

Distinct fault segments are responsible for the recent tectonic reorganisation of the Nubia–Eurasia convergent belt and its fragmentation in distinct tectonic blocks whose boundaries are characterised by alignments of earthquakes and occurrence of volcanic activity. Several seismic events were caused by slip on 30-40km long normal fault segments mainly located in the Hyblean-Malta offshore that also generated the largest tsunamis ever occurred in southern Italy.

With regards to geological hazards in the Sicily Channel, recent GPS data and local seismicity events suggest that deformation processes could still be active and accomplished through deep-buried structures. Moreover, several normal faults showing moderate displacements have been identified on top of the Madrepore Bank and Malta High, offsetting the Late Quaternary deposits. Finally, inside the northern part of the Gela Basin, multiple slope failures, originated during Pleistocene by the further advancing of the Gela Nappe, reveal tectonically induced potential instability processes.