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Earthquake-triggered landslides along the Hyblean-Malta Escarpment (off eastern Sicily, Italy). Assessment of the related tsunamigenic potential.

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Eastern Sicily is affected by earthquakes and tsunamis of local and remote origin, which is known through numerous historical chronicles (see e.g. the double earthquake+tsunami events of 1693, 1783 and 1908) and also through the analysis of tsunami deposits and traces found by onshore and offshore geological investigations.

Recent studies have put emphasis on the role of submarine landslides as the direct cause of the main local tsunamis, envisaging that earthquakes (in 1693 and 1908) did produce a tsunami, but also that they triggered mass failures that were able to generate an even larger tsunami, the one indeed producing the largest observable effects. The debate is still open, and though no general consensus has been found among scientists so far, this research had the merit to attract attention on possible generation of tsunamis by landslides off Sicily.

In this paper we investigate the tsunami potential of mass failures along the Hyblean-Malta Escarpment (HME), the main offshore geological structure of the region running almost parallel to the coast off eastern Sicily. Here, bottom morphology and slope steepness favour soil failures. In our work we have studied slope stability under seismic load along a number of HME transects by using the Minimun Lithostatic Deviation (MLD) method, which is based on the limit-equilibrium theory. The main goal is to identify sectors of the HME that could be instable under the effect of realistic earthquakes. We have estimated the possible landslide volume and we have used it as input for numerical codes to simulate the landslide motion and the consequent tsunami.

This is an important step for the assessment of the tsunami hazard in eastern Sicily and for local tsunami mitigation policies. It is also important in view of tsunami warning system since it can help to identify the minimum earthquake magnitude capable of triggering destructive tsunamis induced by landslides, and therefore to set up appropriate knowledge-based criteria to launch alert to the population.

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