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Active tectonics along the submarine slope of south-eastern Sicily: The case of the 1693 earthquake and tsunami

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The south-eastern region of Sicily has been affected by large historical earthquakes, one of which, the January 11, 1693 earthquake, has been considered as the largest earthquake in the history of Italy. This earthquake has also been accompanied by a large tsunami, suggesting a source located in the offshore. The fault system along the Eastern Sicily Escarpment has been recently worked out in detail (Argnani and Bonazzi, 2005). In particular, the segment of the Malta Escarpment extending north of Siracusa is characterised by the presence of NNW-SSE-trending east-dipping extensional faults located along the morphological escarpment and a few km east of it. Moving south along the eastern Sicily slope, the previously mentioned fault system dies out rapidly. The realistic fault geometry, that has been derived from the interpretation of depth migrated seismic data, has been used for modelling tsunamigenic source, with specific reference to the earthquake and tsunami that stroke violently the eastern coast of Sicily on January 11, 1693 (Argnani et al., 2005; Armigliato et al., 2007; Tinti et al., 2007; Argnani et al., 2010). Previous modelling, in fact, used only loosely constrained and idealized fault geometries. The outcomes of the numerical simulations based on the aforementioned fault system, which are the main topic of a companion paper (Armigliato et al.), are in good agreement with the historical accounts in terms of polarities of the first waves and distribution of the maximum tsunami elevations along the Sicily coastline.
The offshore surveys have also led to identify a large size submarine slide (almost 5 km3) along the souh-eastern Sicily slope (Armigliato et al., 2007; Tinti et al., 2007; Argnani et al., 2010). This slide occurs just at the scarp of the active fault, affecting the uplifted footwall sediments. The tsunamigenic effect of this slide has been investigated using numerical modelling, showing that such sort of source gives significant signals on the coast, with a distribution that is in agreement with most historical observations (Armigliato et al., 2007; Tinti et al., 2007; Argnani et al., 2010). Although the occurrence of a submarine landslide is often taken as an indication of an onland location for the 1693 earthquake (e.g., Billi et al., 2010), both the magnitude of the tsunami waves and the regional distribution of the effects point to a seismic source located offshore. It is to be remarked that a combination of offshore earthquake faulting and slide cannot be ruled out since it too can account for the large run up waves reported for the January 1693 event.

References

Argnani A., Bonazzi C.; 2005: Tectonics of Eastern Sicily Offshore. Tectonics, 24, TC4009, doi:10.1029/2004TC001656.

Argnani A., Tinti S., Armigliato A., Zaniboni F., Pagnoni G., Bonazzi C.; 2010: Active tectonics, earthquakes and tsunamis along the submarine slope of south-eastern Sicily. ESF-FWF Conference, Submarine Paleoseismology: The Offshore Search of Large Holocene Earthquakes, 11-16 September 2010, Universitätszentrum Obergurgl, Austria.

Argnani A., Tinti S., Armigliato A., Bonazzi C.; 2005: Neotectonics and tsunamigenic potential of the Eastern Sicily Escarpment. GNGTS, 24-Convegno Nazionale, Roma, 15-17 November 2005.

Armigliato A., S. Tinti, F. Zaniboni, G. Pagnoni, A. Argnani; 2007: New contributions to the debate on the cause of the January 11th, 1693 tsunami in eastern Sicily (Italy): Earthquake or offshore landslide source (or maybe both)? Eos, Transactions of the American Geophysical Union 88 (52), Fall Meeting Supplement, Abstract S53A-1019.

Billi A., Minelli L., Orecchio B., Presti D.; 2010: Constraints to the Cause of Three Historical Tsunamis

(1908, 1783, and 1693) in the Messina Straits Region, Sicily, Southern Italy. Seismological Research Letters, 81/6, doi:10.1785/gssrl.81.6.907.

Tinti S., A. Argnani, F. Zaniboni, G. Pagnoni, A. Armigliato; 2007: Tsunamigenic potential of recently mapped submarine mass movements offshore eastern Sicily (Italy): numerical simulations and implications for the 1693 tsunami (Abstract 8235), in International Union of Geodesy and Geophysics XXIV General Assembly, 2–13 July 2007, Perugia, Italy.