



Study of the possible sources of the January 11, 1693 tsunami in eastern Sicily (Italy) through numerical modelling

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According to the most recent Italian seismic catalogues (e.g. CPTI04), the January 11, 1693 earthquake in eastern Sicily is the event with highest magnitude ($M_w=7.4$) in the Italian history. It was followed by a catastrophic tsunami, whose effects were observed along the entire eastern Sicily coasts and even on the Malta archipelago to the south. The scientific community is still debating the problem of the identification of the genetic fault: the main point consists in the non-uniqueness of the solution depending on the particular set of modeled data and/or observations. In particular, the shape of the macroseismic intensity field appears to be coherent with a parent fault placed for the largest part, if not completely, inland; on the other hand, the historical evidences concerning the size and the extension of the tsunami effects along the Ionian coasts of Sicily seem to require a tsunami source placed mainly offshore.

In this study we took into consideration several different possible sources proposed in the literature, placed in correspondence with different tectonic units (Hyblaean-Malta offshore escarpment, Scordia-Lentini graben, Hyblaean plateau). For each fault, we simulated the ensuing tsunami by means of a numerical finite-element code which implements and solves the equations of hydrodynamics in the shallow-water approximation. In each case, the numerical results have been compared with the available coeval accounts regarding the main tsunami characteristics (first wave polarities and maximum wave heights in different coastal places). We will discuss the results, and stress that their interpretation depends heavily on one basic question: was the earthquake the only relevant source of the tsunami, or did other causes coexist (for example earthquake-triggered submarine landslides)? In the first hypothesis, which is the only one that can be presently investigated due to lack of data on landslide bodies offshore

eastern Sicily, our simulations show that the available tsunami observations can be justified uniquely by faults placed offshore along the Hyblaean-Malta escarpment.