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Worst-case scenario approach to the tsunami hazard assessment for the coastal areas between Augusta and Siracusa, eastern Sicily, Italy

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The province of Siracusa encompasses a very long portion of the eastern Sicily coastline, ranging from the southern part of the Catania Gulf to the north down to the southern-eastern end of the island, known as Capo Passero. Within this domain, the area comprised between the towns of Augusta and Siracusa has been selected as one of the sites for the testing of innovative methods for tsunami hazard, vulnerability and risk assessment and reduction developed in the frame of the EU Project called ASTARTE - Assessment, STrategy And Risk Reduction for Tsunamis in Europe (Grant 603839, 7th FP, ENV.2013.6.4-3). The selection was driven by two main reasons. First, the area was hit by at least seven tsunamis in the approximate time interval from 1600 BC to present, as can be deduced from historical catalogues and paleo-tsunami deposits analysis: the most famous are probably the 21 July 365, 4 February 1169, 11 January 1693 and 28 December 1908 tsunamis. Secondly, as a whole, the test site has a strong relevance from the industrial, commercial, military, historical and cultural points of view: here it is sufficient to mention the huge petrochemical pole in the Augusta bay and the listing of Siracusa as UNESCO World Heritage Site since 2005.

This contribution deals with the tsunami hazard assessment for the Augusta-Siracusa area, approached through the worst-case credible scenario technique. We selected five main source areas: the choice is driven mainly by the already mentioned fact that historical catalogues and paleo-tsunami studies tell us that the area under investigation can be impacted by tsunamis generated both in the near-field and in the far-field. The five areas include the Hyblaean-Malta escarpment and the Messina Straits in the near-field, the western and eastern lobes of the Ionian subduction zone in the intermediate field, and the western Hellenic Trench in the far-field. In each source area, a selection of possible faults was made, whose characteristics and earthquake magnitude intervals were defined on the basis of the published literature, of public seismogenic fault databases and of discussion with other partners in ASTARTE. In total, 81 faults are taken into account. In addition, since landslides cannot be ruled out as possible sources of tsunamis hitting eastern Sicily, two landslides scenarios are proposed, based on the analysis of the morphology of the seafloor in correspondence with the Hyblaean-Malta escarpment. After a first screening of the earthquake scenarios based on the comparison of the expected maximum wave elevations along the eastern Sicily coasts, we reduced the overall number of significant scenarios to eight. For each of these, we run numerical tsunami simulations by means of the in-house UBO-TSUFD code over a set of five nested grids, with resolutions decreasing from 3 km in the open Ionian sea to 40 m in the target areas of Augusta and Siracusa. The simulation results consist of fields of maximum water elevation, of maximum water column, of maximum velocity and of maximum momentum flux. The main findings for each single scenario and for the aggregate scenario are presented and discussed.