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# Tsunami inundation scenarios and tsunami vulnerability assessment for the town of Alexandria, Egypt

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Historical catalogues indicate that Alexandria was severely affected in the past by several tsunami events. The tsunami hazard in that area is mainly due to far-field tectonic sources. The two most famous earthquakes that generated tsunamis whose impact was experienced also by Alexandria and the surrounding area are the 365 AD and the 1303 earthquakes, whose sources are still a matter of debate but are frequently located in correspondence with the western and eastern sectors of the Hellenic Arc. Nowadays, Alexandria is the second biggest city in Egypt as regards population (3.9 million), it is a key economic area in northern Africa and it has a very important tourist activity. Hence the proper assessment of tsunami hazard-to-risk must be regarded as an important task, which was partially undertaken in the very recent past by projects such as TRANSFER (EU-FP6). It is also worth mentioning that the overall eastern Mediterranean is one of the areas chosen by the EU-FP7 Project TRIDEC to test a new generation Tsunami Early Warning Decision Support System.

We assess the hazard by performing numerical simulations of tsunami impact in Alexandria through the worst-case scenario technique. We identify three main seismic sources: the western Hellenic Arc (reference event 365 AD, magnitude 8.3), the eastern Hellenic Arc (reference event 1303, magnitude 8.0) and the Cyprus arc (hypothetical scenario with magnitude 8.0, inferred from the tectonic setting and the historical seismic catalogues). All the simulations and the inundation maps are computed by means of the UBO-TSUFD code, developed and maintained by the Tsunami Research team of the University of Bologna, which solves the non-linear shallow-water equations allowing for the computation of run-up and inundation on nested grids. For each of the considered scenarios we compute all the relevant tsunami metrics, i.e. water elevation, current speed, flow depth and momentum flux. We find that the case that produces the most relevant flooding in Alexandria is the eastern Hellenic Arc scenario, with waves reaching heights up to 5 meters. We also prepare an aggregated field for each relevant physical parameter, by choosing for each parameter the highest value in each computational grid point. The aggregated fields are finally used for a preliminary tsunami vulnerability assessment based on a methodology developed by the EU-FP6 SCHEMA Project, based on the adoption of a suitable building damage matrix and on water inundation depth.