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A method to estimate expected fatalities and economic loss of buildings in an urban environment as a step toward tsunami risk assessment: an application to the city of Siracusa, Italy.

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Siracusa, an important city of the south-east Sicily, is located in an area highly exposed to the danger of tsunami, local and remote. Among the many events that affected this area those with a major effect are the AD 365 tsunami generated by an earthquake in the Western Hellenic Arc, the event of 11 January 1693, following an earthquake in the area of Augusta, and the tsunami of 28 December 1908 generated in the Messina strait.
The aim of this study is to evaluate the number of exposed people and of fatalities as well as the type of damage to constructions and the associated loss of economic value in case of a tsunami, based on a simple tsunami scenario, i.e. on assuming a uniform inundation level of 5 m. This figure is considered appropriate for this preliminary tsunami loss analysis since it is compatible with historical tsunami observations and is also supported by recent tsunami hazard studies carried out for this area (Armigliato et al., 2015). The main physical tsunami parameter used in computations is the water column, which is merely the difference between the assumed inundation level and the topographic altitude.
We use numerical geo-referenced 1:2000 maps providing a database of constructions in the area of Siracusa together with data from national and local statistical institutions to make estimates on the number and type of buildings and on the number of people that may be found in the inundation area in different periods of the year, discriminating between residents and tourists.
Using a variant of the Terrier et al. (2012) table and tsunami mortality curves proposed by Koshimura et al. (2009) we are able to estimate expected fatalities with tsunami inundation reaching at most the first floor of buildings. We calculate economic loss by taking into account both residential buildings and commercial-industrial structures and data from the real estate market.
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