



Seismic hazard assessment and risk mitigation at Ischia island (Naples, Southern Italy): a paradigm for seismic risk management in Italy

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Ischia island, South-West of Naples, is worldwide renowned for its beautiful landscapes and thermal springs. It is a volcanic island, in which volcano-tectonic phenomena generate the occurrence of small to moderate magnitude earthquakes that, due to their very shallow depth (less than 2 km), occasionally cause intense damage and casualties, up to complete destruction of buildings within a small distance (2-3 km) from the epicentre. Earthquakes at Ischia island almost all take place at shallow depth below the Northern slopes of the Mt. Epomeo horst, just below the town of Casamicciola, which was in fact completely destroyed by the 1883 earthquake, reaching intensities up to XI degree on the Mercalli scale. The 1883 earthquake, killing about 2300 people, was forerun in 1881 by a smaller earthquake, killing about 130 people; the whole sequence of moderate magnitude, destructive earthquakes, started in 1828. A similar sequence of destructive earthquakes located in the Casamicciola area occurred in the 18th century. Seismicity in this island is hence peculiar, both because of the very shallow depth (which amplifies the effect with respect to normal tectonic earthquakes, though involving a small damaged area) and of the clustering in time.

Despite such peculiar and very destructive character, seismic hazard in this area has been strongly underestimated till now by official hazard maps, which take into account only the effects of continental earthquakes, hence neglecting the most effective source of hazard, which is the local seismicity. On August 21st 2017, a moderate magnitude earthquake struck the area of Casamicciola, killing two people, injuring many more and causing huge damage and partial to total collapse of edifices locate just above the earthquake fault.

The maximum acceleration recorded for this earthquake exceeded the reference acceleration imposed to be sustained by edifices, according to official hazard maps, of a factor 1.6. The observation of seismic accelerations overcoming the reference ones prescribed by hazard maps, and the difficulty to manage the vulnerability of ancient edifices, are common for many recent earthquakes in Italy, and are generally causing grief and destruction also for moderate magnitude earthquakes. We propose here a complete procedure to assess the hazard and mitigating the risk, for the Ischia case study, where it can (and should) be fast and economically applied, avoiding further grief due to possible occurrence of other destructive earthquakes in short time. Such a procedure can be then generalized to the seismic hazard assessment and risk mitigation of the whole Italian area, solving the problems actually evidenced after any moderate to large magnitude earthquake in Italy.