



Near field earthquake sources scenarios and related tsunamis on the French-Italian Riviera (Western Mediterranean)

Christophe Larroque (1), Mansour Ioualalen (1), and Oona Scotti (2)

(1) CNRS-IRD-UNS, UMR Geoazur, Valbonne, France (larroque@geoazur.unice.fr), (2) IRSN-BERSSIN, Fontenay-aux-Roses, France (oona.scotti@irsn.fr)

The large system of thrust faults recently evidenced at the foot of the northern Ligurian margin accommodates the inversion of this ancient passive margin since at least 5 Ma (Messinian times). At depth, these faults are certainly connected to a major northward dipping thrust that accounts for the major part of the seismicity in the northern Ligurian Sea. The deformations of the Quaternary sediments along the faults attest to a compressive tectonic regime consistent with the focal mechanisms of earthquakes. The major event in the area (the Ligurian earthquake, 1887/02/23, Mw 6.7-6.9 and the related tsunami) could result from the activation of part of the Ligurian thrust. Starting from the Ligurian earthquake source characteristics (strike: N55°E, dip: 16°N, length: 35 km, width: 17 km, co-seismic slip: 1.5 m, focal depth: 15 km, Mw 6.9), we have built an exhaustive set of earthquake scenarios involving the 80 km long Ligurian thrust. (1) Two of these earthquake scenarios ruptured respectively the eastern (offshore Imperia) and western (offshore Nice) part of the Ligurian thrust. (2) As these scenarios must scan the range of potential events in accordance with the geology, a second group of scenarios tests an 80 km long rupture of the entire Ligurian thrust with different strikes (N55°E and N70°E) and different widths of the faulting surface (17 km and 27 km) and then co-seismic slips of 2 m and 3.3 m, respectively. As the Ligurian coast is a densely populated and industrial area, the vulnerability is high. We want to stress here that we are more concerned with tsunamis triggered by local earthquakes. This is because, considering their arrival times (a few minutes), the risk prevention cannot be handled by existing tsunami warning system. For all scenarios we evaluate the tsunami coastal impact. The spatial distribution of the maximum wave height (MWH) is provided with a tentative identification of the processes that are responsible for it. The predictions suggest that the wave impact is mostly local considering the relatively moderate size of the rupture planes compared to large subduction earthquake induced tsunamis. The studied scenarios show that for such events specific localities along the French-Italian Riviera (San Remo, Cipressa, Imperia, Diano Marina, Nice) may experience very significant MWH (in the range of 3 to 10 m depending of the co-seismic slip and magnitude) related to the shallow focal depth tested for such scenarios. We may reasonably conclude that the tsunami threat is relatively significant and uniform along the Italian side of the Riviera (from Ventimiglia to Imperia) while it is more localized along the French side from Ventimiglia to Antibes with however higher local level of inundation, e.g., Nice city center, in case of a complete rupture of the Ligurian thrust faults system.