Supplementary Material

1 PARAMETERS OF THE DISTRIBUTION LAW

The Table S1 gives the best parameters of the distribution laws per seismogenic zone which are obtained using the concatenated earthquake catalogue, keeping aftershocks and removing records without moment magnitude (Section 2.1.4). Earthquakes were collected from the various databases up to the December 31, 2018. The annual rate is given for a magnitude 5.0 in order to allows the comparison of the annual rates given in Sørensen et al. (2012). The Table S1 also shows the inequality between the different seismogenic zones in terms of earthquake recording using moment magnitude. Indeed, the moment magnitude is more often given for the largest magnitudes because it is easier to determine the seismic moment for larger earthquakes. The Ligurian seismogenic zone (z05) is exceptional here as the local magnitude was homogeneously converted by Manchuel et al. (2018) with moment magnitude down to 1.0. However, there are no records posterior to 2009 in this seismogenic zone, because the magnitude estimation uses a local scale in this area.

Table S1. Summary of the best distribution obtained per seismogenic zone (no magnitude conversion).

	Dataset			Completeness		Distribution parameters			
Zone	Date range	Magnitude range	Number	Method	M_0	$\lambda_{M=5}$	β	Ccoef	R^2
z01	1048–2011	4.0–6.8	282	MAXC	4.4	0.09	1.39	0.99	0.83
z02	1578–2016	4.0–6.7	214	MAXC	4.2	0.01	1.62	0.98	0.91
z03	1365–2018	4.0–7.3	1044	MAXC	4.4	0.33	2.01	0.98	0.95
z04	1758–2017	4.0–7.0	489	MAXC	4.4	0.24	3.36	0.98	0.94
z05	1182–2009	1.0–6.7	2173	MBS	1.8	0.02	1.50	0.98	0.93
z06	1091–2013	3.1–6.1	201	MAXC	5.0	0.08	2.85	0.99	0.86
z07	1125–2018	3.0–7.4	375	MAXC	4.4	0.11	1.58	0.99	0.74
z08	1172–2023	4.0–7.2	237	GFT	4.8	0.14	1.81	1.00	0.98

2 GAIN RELATED TO THE SELECTION OF SIGNIFICANT TSUNAMIS

Tsunami simulations were run on PLUIE calculator, composed of 12 Bull X B510 nodes of 16 threads each. The computational time of one hour propagation of tsunami using the low-resolution grid is about 30 s using one node, whereas the computational time of one hour propagation of tsunami using the four nested grids is about 388 s using ten nodes (Fig. S1A). The estimation of the total computational time t_{CPU} of the N_{sce} tsunami simulations is given by

$$t_{\mathsf{CPU}} = t_{\mathrm{CPU/1h}} \sum_{i=1}^{N_{\mathrm{sce}}} \mathrm{ETA}_i, \tag{S1}$$

where $t_{\mathrm{CPU/1h}}$ is the computational time to simulate a one-hour propagation of tsunami (SD: 30 s, HD: 388 s).

The selection of significant tsunamis is then required due to the large computational times while performing the high-resolution simulations. In the present case, the selection remains efficient to reduce the computational time if the selection of the significant tsunamis involves less than 92 $\%$ of the total hours of tsunami propagation to simulate.

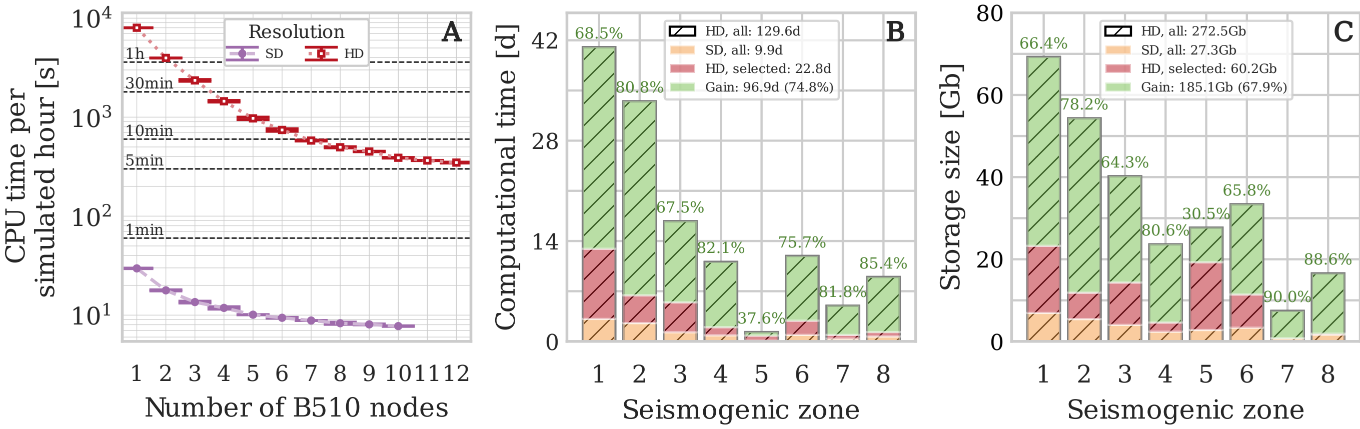

Figure S1. Selection of significant tsunamis. **(A)** Computational times for a one-hour high-resolution and low-resolution simulations as a function of the number of nodes, on PLUIE calculator. **(B)** Time saving per seismogenic zone. **(C)** Storage gain per seismogenic zone. The boxes show the time and place required if all high-resolution simulations are performed. Superimposed on the boxes, yellow patches show the incompressible time and storage necessary for low-resolution simulations; red patches, the time and storage for high-resolution simulations of the significant tsunamis; and green patches, the time and storage that are saved due to the selection of tsunamis.

The selection of significant tsunamis allows to save about 194 days when performing S-PTHA in the Bay of Cannes (Fig. S1B). Since the seismic sources within the South Eastern Spain (z01) and the Northern Morocco (z02) seismogenic zones are further away from the study area, their tsunamis impact the Bay of Cannes less than the tsunamis triggered within the North Algerian (z03) and Ligurian (z05) zones. It is therefore in these zones z01 and z02, that we save most of the computational time. The selection of the tsunami also allows to save about 350 Gb of storage. (Fig. S1C).

Note that the storage is related to the number of scenarios while the computational time is correlated to the number of hours of tsunami propagation to simulate. Then, the time saving and the storage gain are not distributed the same way across the seismogenic zones.

3 MINIMUM MAGNITUDE OF SIGNIFICANT RUPTURES AND MISSING RUPTURES FOR EXISTENT EARTHQUAKES

Not all earthquakes of magnitude 5.5 and above could be associated with at least one of the rupture scenarios obtained from the CENALT unit fault system (Fig. S2). Nevertheless, these non-associated earthquakes are located where the scenarios, selected as significant in the Bay of Cannes, have greater magnitudes than the observed earthquakes. Most of these non-associated earthquakes are located in the Sicily (z07) and Calabria (z08). Fortunately, according to the selection of the significant tsunamis within these seismogenic zones, a few number of tsunamis triggered by earthquakes from these two zones are significant in the Bay of Cannes (Table 2).

However, it is still essential, in the long term, to complete the fault system to be as exhaustive and as close as possible to reality independently from the ROI. In particular, the lack of rupture scenarios to fit the earthquakes in Sicily and Calabria might be due to a more complex fault regime in this region.

REFERENCES

Manchuel, K., Traversa, P., Baumont, D., Cara, M., Nayman, E., and Durouchoux, C. (2018). The French seismic CATalogue (FCAT-17). *Bulletin of Earthquake Engineering* 16, 2227–2251

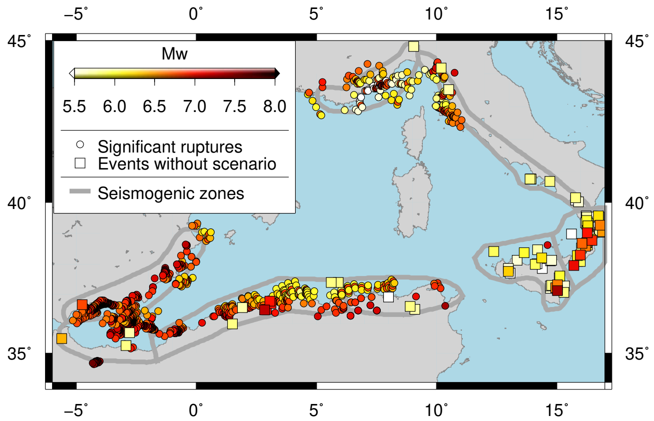

Figure S2. Minimum moment magnitude of significant ruptures and earthquakes without rupture scenario. Circles: location of the synthetic seismic ruptures that can produce a significant tsunami in the Bay of Cannes, the colors show the minimum moment magnitude for the rupture to be significant. Squares: location and moment magnitude of the 82 earthquakes for which no rupture scenario is found within 30 km from the epicentre.

Sørensen, M. B., Spada, M., Babeyko, A., Wiemer, S., and Grünthal, G. (2012). Probabilistic tsunami hazard in the Mediterranean Sea. *Journal of Geophysical Research: Solid Earth* 117, 2465–2482. doi:10.5194/nhess-13-2465-2013