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From regional to site specific SPTHA through inundation simulations: a case study for three test sites in Central Mediterranean

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We propose a procedure that enables the quantification of tsunami hazard at specific target sites through numerical simulations, accounting for the full variability of potential seismic sources. To this end, we developed a method that reduces the computational effort required by a very large number of detailed inundation simulations by adopting the offshore tsunami propagation patterns used for regional Seismic PTHA (SPTHA) as a proxy for the subsequent hazard estimate. The reduction of the computational effort is based on a two steps filtering procedure of the offshore SPTHA, through which a reduced number of scenarios to be modelled for inundation is selected. Each scenario represents a larger set of sources that form a cluster of potential tsunamis with similar impact on the target area. This filtering procedure is completely based on the tsunami profiles offshore, and it represents a generalization of the method proposed in Lorito et al. (2015) allowing i) to consider a much larger set of input linear simulations, and ii) to control the within-cluster variance of each selected cluster of seismic sources (thence, indirectly the artificial uncertainty introduced in probabilistic inundation maps by this filtering process).

Here we present the preliminary results obtained for three test sites in central Mediterranean (Milazzo and Siracusa, Southern Italy, and Thessaloniki, Northern Greece). We preliminary perform a regional SPTHA covering the whole Mediterranean, in which the aleatory variability is quantified considering about 2×10^7 different seismic sources, and epistemic uncertainty is explored through an ensemble model based on more than $\times 10^5$ alternative model implementations. For each site, separately, few hundreds of "representative scenarios" are filtered out of all the potential seismic sources. Then, the inundations caused by such scenarios is explicitly modelled and the site-specific SPTHA obtained, allowing a complete characterization of the tsunami hazard in terms of inundation depth and velocity time histories.

This procedure and the applications have been developed in the framework of the EC projects ASTARTE and STREST.