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The objective of the Tsunami calculations is the estimation of the impact of waves caused by large seismic events on the coasts and the determination of potential inundation areas. In the case of Early Warning Systems, i.e. systems that should allow to anticipate the possible effects and give the possibility to react consequently (i.e. issue evacuation of areas at risk), this must be done in very short time (minutes) to be effective.

In reality, the above estimation includes several uncertainty factors which make the prediction extremely difficult. The quality of the very first estimations of the seismic parameters is not very precise: the uncertainty in the determination of the seismic components (location, magnitude and depth) decreases with time because as time passes it is possible to use more and more seismic signals and the event characterization becomes more precise.

On the other hand other parameters that are necessary to establish for the performance of a calculation (i.e. fault mechanism) are difficult to estimate accurately also after hours (and in some cases remain unknown) and therefore this uncertainty remains in the estimated impact evaluations; when a quick tsunami calculation is necessary (early warning systems) the possibility to include any possible future variation of the conditions to establish the “worst case scenario” is particularly important. The consequence is that the number of uncertain parameters is so large that it is not easy to assess the relative importance of each of them and their effect on the predicted results.

In general the complexity of system computer codes is generated by the multitude of different models which are assembled into a single program to give the global response for a particular phenomenon. Each of these model has associated a determined uncertainty coming from the application of that model to single cases and/or separated effect test cases. The difficulty in the prediction of a Tsunami calculation response is additionally increased by the not perfect knowledge of the initial and boundary conditions so that the response can change even with small variations of the input.

The paper analyses a number of potential events in the Mediterranean Sea and in the Atlantic Ocean and for each of them a large number of calculations is performed (Monte Carlo simulation) in order to identify the relative importance of each of the uncertain parameter that is adopted. It is shown that even if after several hours the variation on the estimate is reduces, still remains and in some cases it can lead to different conclusions if this information is used as alerting method.

The cases considered are: a mild event in the Hellenic arc (Mag. 6.9), a relatively medium event in Algeria (Mag. 7.2) and a quite relevant event in the Gulf of Cadiz (Mag. 8.2).