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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Fast evaluation of tsunami scenarios: uncertainty assessment for a Mediterranean Sea database" *by* I. Molinari et al.

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The paper by Molinari and co-authors is a very interesting contribution regarding a methodology to rapidly reconstructing tsunami waveforms at a number of observation points starting from a given static tsunami initial condition. As the authors themselves underline, the methodology is not completely new per se, but the novelty resides in the full analysis of the uncertainties related to a number of different factors. The core of the methodology consists in reproducing the expected waveform at a given observation point by linearly combining the waveforms computed numerically (non-linear equations) at the same point for a number of Gaussian-shaped elementary sources. The coefficients for the linear combination are obtained by reconstructing a given static tsunami initial condition by proper superposition of the elementary sources. The performance of the approach is studied by quantifying the misfit between reconstructed and numeri-

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cally simulated waveforms, the correlation between the maximum tsunami amplitudes, depending on the earthquake magnitude, focal mechanism, focal depth. Furthermore, it has been found that the main error source is related to the reconstruction of the initial condition rather than on the linearity assumption.

This last point is probably the most intriguing. From the theoretical/mathematical point of view, linearly combining results from non-linear simulations should be regarded as a wrong approach. Practically, the conclusion that only a mean 1.7% error derives from applying this approach tells that the adopted "approximation" is not that bad. This can be due to the fact that the 50 m isobath is sufficiently "deep" to limit the non-linear effects (although this varies from place to place). Looking at the problem from another side, one may ask why the database of pre-computed scenarios was populated by running simulations solving the non-linear equations instead of the linear ones. This would have probably resulted in a shorter computational time, at the same time fully justifying from the mathematical point of view the linear combination of he elementary solutions. I ask the authors to write a paragraph or two, maybe in the discussion section, where these aspects are commented and the adopted choices more deeply justified.

Still in he discussion section, I would like to see a paragraph with a detailed example of the consequences of the obtained results on tsunami hazard analysis and/or tsunami warning.

I am attaching an annotated version of the manuscript where I included some further remarks that I ask the authors to take properly into account. Best regards, Alberto Armigliato

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-145/nhess-2016-145-RC1-supplement.pdf

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