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Natural Hazards and Earth System Sciences
Discussions
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Interactive comment on "Scenario based approach for multiple source Tsunami Hazard assessment for Sines, Portugal" *by* M. Wronna et al.

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Here we present our replies to the comments posted on nhess-2015-170 posted by anonymous Referee #1 in nhessd-3-C1508-2015. We also uploaded the revised manuscript in the supplement with the highlighted sections in yellow. Anonymous Referee #1 Received and published: 15 August 2015

Major comments

Major comment 1: I think another important result is the flow velocity which is not presented in your results. Flow velocity is strongly related to the force acting to buildings or moving of boats and containers in the port. Do you have any comments on this? Is it also possible to crate hazard map using flow velocity results?

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Reply to major comment 1: We agree with the reviewer. Flow velocity is an important quantity to describe the tsunami impact. In the present form of the manuscript we comment about tsunami impact on critical infrastructures. However, these structures are not digitized in our model. We calculated the flow velocities for the composite scenario HSMPF for different stages of tsunami propagation. We decided to present maps focusing on the inundation and drawback limits with maximum values of wave height and flow depth rather than flow velocity maps for different stages of propagation. Please see the updated version of the manuscript in section 6 Discussion and Conclusion, paragraphs 2 and 3.

"We also calculated flow velocities for the composite scenario HSMPF at MSL for different stages of tsunami propagation. The median values are about 10 m/s in the inundation area at all terminals in the port. Some extremes of about 20 m/s or higher occur close to the jetties and in the inundation area when the flow depth values are small depending on the considered propagation instant. In general we find that flow velocities increase with lower flow depth values in the inundation area. Considering the HSMPF scenario in MSL conditions the pipelines at the liquid bulk and petrochemical terminal are entirely inundated with up to 5 m flow depth values. These structures are subject to flow velocities of about 10 m/s at first wave impact. At the 17 m topographic contour, the pipelines behind the liquid bulk and petrochemical terminal are not affected by the tsunami (Fig 3d). We find similar flow velocity values at the multipurpose terminal where the pipelines of the liquefied natural gas storage tanks pass. Here the maximum flow velocity values there are slightly above 10 m/s at wave impact, and MFD are between 5 - 10m. The conveyor belt and the stockpiles at the multipurpose are nearly entirely inundated up to 5m and show flow velocities of 10 m/s at first wave impact. The pipelines at the liquid bulk, petrochemical and multipurpose terminal are inundated by all scenarios in the SWIM. These quantitative DTHA results indicate a high risk of potential damage in case of tsunami impact. However, in the building vulnerability is beyond the scope of this study."

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Interactive Discussion

Discussion Paper

Major comment 2: As you selected DTHA for your study, is it possible to add some comments on how much DTHA can represent the results comparing with the PTHA? For example, if the simulated tsunami height at one port form your DTHA is 10 m, what should be the tsunami height in case of PTHA? This is to ensure that your selected scenarios are enough to create reliable hazard maps.

Reply to major comment 2: Omira et al. (2015) published a PTHA study for the Northeast Atlantic. We complemented this study with a DTHA study for Sines. The results of our study are coherent with the results presented in Omira et al. (2015). Please see the updated manuscript in the section 6 Discussion and Conclusion in paragraph 5.

"Our results are compatible with the PTHA results for the Northeast Atlantic. Omira et al. (2015) show that wave heights exceeding 5 m have a probability of 45% of occurrence in 500 years at Sines. Only the scenarios of the SWIM area have the capacity to produce such high tsunami impact along the Portuguese west shore."

Major comment 3: You have mentioned in many part of the manuscript that your study site has many critical facilities. Therefore, you better write some discussions on the risk to these facilities based on your simulation results. I think this can be one way to present your originality. Otherwise, your manuscript is not so different to other scenario based tsunami assessment papers published in recent years. Reply to major comment 3: We comment on the critical infrastructures in the Discussion and Conclusion section in paragraph 3. The paragraph is given in the reply to major comment 1.

Specific comments:

Specific comment 1: Title: You use "scenario based" in the title but in the rest of your manuscript use "deterministic". I suggest to use the same word for the consistency.

Reply to specific comment 1: We changed the Title and in the abstract scenario-based to Deterministic Tsunami Hazard Assessment (DTHA).

Specific comment 2: Abstract: Please also add some of your major results in the

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abstract such as the estimated tsunami height and arrival time.

Reply to specific comment 2: We included some major results in the abstract.

“The results confirm the composite of Horseshoe and Marques Pombal fault as the worst case scenario with wave heights above 10 m which arrives about 22 minutes after the rupture. It governs the aggregate scenario with about 60% and inundates an area of 3.5 km^2.”

Specific comment 3: P4665 L8-30 Please refer these locations mentioned in these sentences using Figures. May be you may start mentioning about Figures 1-3 from here.

Reply to specific comment 3: The locations haven been referred to the figures. Where figure 2, 3 and 4 have been combined to 2a-c.

Specific comment 4: P4666 L3 There are many works done on PTHA in this area but why you selected to use DTHA?

Reply to specific comment 4: Please see the answer to major comment 2.

Specific comment 5: P4666 L22 Start using subsection 2.1 study area and 2.2 digital elevation model from P4668 L12

Reply to specific comment 5: The subsections 2.1 Study area and 2.2 Digital elevation model have been introduced.

Specific comment 6: P4670 L25 What is the maximum and minimum earthquake magnitude used in Omira et al. (2009)?

Reply to specific comment 6: Table 1 in Omira et al. (2009) states earthquake magnitudes 8.1 for the Marques Pombal Fault and 8.6 for the Cadiz Wedge Fault (CWF).

Specific comment 7: P4672 L11 Please draw a table summarizing general detail of the parameters and conditions used in the 18 cases. Also if possible, please draw one figure showing the fault areas.

Reply to specific comment 7: The parameters are given in table 1. The 3 cases of the tide have been stated additionally in the table caption.

We added the fault areas in the updated figure 2.

Specific comment 8: Fig. 3: I suggest to modify the figure by locating the Gloria fault and the study site in the same figure.

Reply to specific comment 8: We prepared a combination of figure 2 and figure 3 with overview map of the location of the 2 source zones. Please see figure 2.

Specific comment 9: Fig. 4: Just to make sure if these figures represent which results (MWH or MFD or MDB or MRU)? Because I do not think that each sub-figure such as a) CWF can represents all results

Reply to specific comment 9: We updated the figure caption to better explain the given results. MRU has been changed to maximum inundation area (MIA) as the area between the coastline and maximum inland penetration (MIP). Please see the present figure captions of Fig. 3, 5 and 6.

"Figure 3. Results of MWH, MFD, MDB, MIA and MIP of the SWIM scenarios considering MSL: (a) CWF, (b) GBF, (c) HSF, (d) HSMPF, (e) MPF. MWH and MFD are presented by the colour bar in the lower right corner offshore and on land respectively. Offshore and land are separated by the coastline (black line). MDB is indicated by the dark blue line. The MIA is given between the coastline and the MIP (red line)."

"Figure 5. (a) Results MWH, MFD, MDB, MIA and MIP for the Gloria scenario at MSL: MWH and MFD are presented by the colour bar offshore and on land respectively. Offshore and land are separated by the coastline (black line). MDB is indicated by the blue line. The MIA is given between the coastline and the MIP (red line). (b) synthetic waveform for 6h propagation time at 3 chosen points (cf. Fig. 1) for the Gloria scenario."

“Figure 6. MWH, MFD, MDB, MIA and MIP for the aggregate scenario considering all stages of the tide. MWH offshore and MFD on land are presented by the colour bar. MDB is indicated by the thick dark blue line. The MIA is given between the coastline (black line) and the MIP (red line).”

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/3/C1975/2015/nhessd-3-C1975-2015-supplement.pdf

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 4663, 2015.