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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "La Palma landslide tsunami: computation of the tsunami source with a calibrated multi-fluid Navier–Stokes model and wave impact assessment with propagation models of different types" *by* Stéphane Abadie et al.

Stéphane Abadie et al.

stephane.abadie@univ-pau.fr

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Anonymous Referee #2

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Overall Assessment: The study is an important contribution to assessing the tsunami hazard to the coasts of countries exposed to the potential tsunami from the collapse of the Cumbre Vieja volcano at La Palma island. The study is not just useful for the scientific community but also to disaster managers of those countries so as to better

prepare for any eventuality. I would like to recommend this manuscript provided the author addresses the following comments.

Comments: Pages 1-3: Section 1 on introduction should also mention modelling studies related to the Storegga slide event and anak krakatau December 2018 event.

Response : The following references on the Anak Krakatau are now quoted in the introduction:

Paris, A., Heinrich, P., Paris, R., and Abadie, S.: The December 22, 2018 Anak Krakatau, Indonesia, Landslide and Tsunami: Preliminary Modeling Results, Pure and Applied Geophysics, pp. 1–20, 2019.

Grilli, S. T., Tappin, D. R., Carey, S., Watt, S. F., Ward, S. N., Grilli, A. R., Engwell, S. L., Zhang, C., Kirby, J. T., Schambach, L., et al.: Modelling of the tsunami from the December 22, 2018 lateral collapse of Anak Krakatau volcano in the Sunda Straits, Indonesia, Scientific reports, 9, 2019.

Regarding the Storrega slide, two additional references are quoted in the new paragraph on landslide tsunami models provided in section 2.1, namely:

Løvholt, F., Bondevik, S., Laberg, J. S., Kim, J., and Boylan, N.: Some giant submarine landslides do not produce large tsunamis, Geophysical Research Letters, 44, 8463–8472, 2017

Kim, J., Løvholt, F., Issler, D., and Forsberg, C. F.: Landslide Material Control on Tsunami GenesisâĂŤThe Storegga Slide and Tsunami (8,100 Years BP), Journal of Geophysical Research: Oceans, 2019.

Moreover, an index map should also be provided showing the location of Cumbre Vieja volcano with reference to the potential areas that may be exposed to the ensuing tsunami in case of collapse. The index map should also show zoom in regions that are being analysed in the paper.

Response : Done: See Figures 4 to 7.

Page 5: What are the reasons for using THETIS over other available models in Section2.2?

Response : A review of the most advanced models for landslide tsunami generation is now provided in section 2.1 for qualitative inter-comparison with THETIS. As a full 3D Navier-Stokes model with 3 phases, THETIS is clearly one of the most advanced types of models, although the CPU time required is substantial. The authors' team has more than 20 years of experience with this kind of model, though more frequently used for small scale fluid mechanics problems than in geophysical flows of large scale. Moreover, as stated now in the text (see section 2.1), "THETIS has been validated against several benchmark cases involving tsunami generated by 2D and 3D solid blocks (Abadie et al., 2010) and granular subaerial and submarine slides (Clous and Abadie, 2019)Âă".

Pages 3-9: All the models discussed share the same basic equations, differences between those models must be presented in one single section. These differences may be with respect to assumptions, limitations or the numerical methods used. No need to show the equations.

Response : Equations have been removed, information on model resolution, coordinate type (spherical, Cartesian), Manning coefficient distribution, wetting-drying algorithms schemes at the shore, and breaking wave modeling is now provided. The purpose of comparison is also clarified.

Pages 3-9: Following section 2.3 on models used for long distance propagation, a separate section on the DEM should be provided. Also, figure showing elevations of the computational region must be provided. A subsection on the grids used in each of the models can then be covered in this section.

Page 15 line 27: Limitation and assumptions of the current study should be discussed

in this study.

Page 16: Conclusion should discuss steps that can be considered for improvement in better understanding the tsunami hazard.

Response : Limitations and improvements are now discussed more in details at the end of the discussion section.

Figures 8 and 9 are hard to follow especially in terms of location and orientation of slide.

Response : Snapshots showing quantitative (slide plan view and thickness evolution with time) and therefore reproducible results on the slide and the wave generation are now provided in Figure 8. In addition to the existing SEANOE repository (DOI 10.17882/61301) which contains wave data for the source, we have added a directory with the necessary information for interested readers to be able to perform their own simulations with the same initial conditions as the current paper.

Figure 18 and 19: fonts are not clear.

Response : Those figures have been redrawn with better fonts (Figures 17-new and 18-new).

Please also note the supplement to this comment:
https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2019-225/nhess-2019-225-AC2-supplement.pdf

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