

Interactive comment on “Multilayer-HySEA model validation for landslide generated tsunamis. Part I Rigid slides” by Jorge Macías et al.

Anonymous Referee #1

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General Comments:

This is an informative paper on state of the art tsunami modeling for land-slide generated tsunamis. The study presents results of performing simulations for 3 benchmark problems provided by the National Tsunami Hazard Mitigation Program (NTHMP) with the numerical code Landslide-HySEA. The topic and results presented in the paper are within the scope NHESSD topics. The paper provides a sufficiently detailed description of both, the governing equations modeled in the code and the numerical algorithm implemented to resolve the system. Additional references are provided for readers interested in additional details. The authors provide and adequate literature review of pre-existing validation efforts in the introductory section of the report and with a few necessary improvements also provide a clear and understandable description of the

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numerical implementation of the laboratory experiments used for the validation. The results are presented in a clear and concise manner.

The first part of the paper could benefit from a thorough English language and stylistic review, particularly (Sections 1, 2). The style seems to improve after those two sections. It should also be reviewed for some typos:

Some examples typos are provided in the Specific Comments below.

Specific Comments:

pp1. Please correct the sentence: “ The US National Tsunami has proposed the experimental data used Hazard and Mitigation Program (NTHMP) and established for the NTHMP Landslide Benchmark Workshop, held in January 2017 at Galveston.” to “ The US National Tsunami Hazard and Mitigation Program (NTHMP)...”

pp2. l. 9; Please, provide reference for “Catalina Island ” 2006 workshop.

pp3. l. 33; Fifteen or twenty?, please specify.

pp.4. Please, clarify the type of approximation the Landslide-HySEA uses to model the physical system. Are vertical pressure and velocity gradients modeled linearly within each layer with matching values at the interphase between layers?. What is exactly meant in line 74 by “ The multilayer model is able to take into account the full vertical structure” isn’t this an overstatement, please clarify.

pp. 5 Please, label equations throughout the paper.

pp. 5 (Equation System 1). There seems to be a lack of symmetry in the discretization of the continuity equation. Is this meant to be one-sided discretization?. Please, check.

pp 6. l. 109; Linearization around what “lake”?

pp. 8 Table 1. Please, include expression for Phase Velocity from Airy linear theory for reference. Why is only Phase Velocity approximations shown? What about Group

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Velocity and Shoaling Gradient?

pp. 8 l. 145-147, Please, check if expected values of kH for your numerical experiment fall within the range properly modeled in your approximations ($5 < kH < 15$ pp7-8, l.144...), the paper would benefit from a brief discussion on this topic.

pp. 11. l. 168-174. Please, from the explanation on how the solution proceeds, the elliptic operator for the continuity equation seems to be computed implicitly, the pressure terms calculated with the solution from the continuity equation and then the discharge field updated in time explicitly? If this is the case, a bit more detail explanation would be appreciated. Otherwise, please clarify how the solution proceeds.

pp. 14, Figure 5. From the curves, the motion of the block seems to stop abruptly. Is this correct?

pp. 14, 223. Please, specify where in the domain outflow conditions are imposed.

pp. 14 & 23. Please, clarify how a Smagorinsky turbulent model for the Reynolds stresses is used in this context. Do the field equations preserve the classic Navier-Stokes viscous stress tensor for the resolved scales and a Smagorinsky model is then used for the Reynolds stresses?. The text seems to confuse these two terms as if they are the same one, but both are present separately in the Reynolds averaged Navier-Stokes equations.

pp. 17 Table 4. Please, define all variables in the column 1 of Table 4.

pp 23. l. 313; Please specify if $\delta x = \delta y$.

pp.23. Figure 12, please specify units in geometry parameters.

pp.26 l. 335; "...homogeneous, inviscid, and ..." is it inviscid, or have viscous terms been included as stated in pages 14 and 23? Please. correct.

pp.26 l. 355-356; The last sentence should be supported with results from full N-S models, otherwise I suggest to eliminate.

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A couple of examples of typos that need correction:

pp. 1, Abstract; "The US National Tsunami has proposed the experimental data used Hazard and Mitigation Program (NTHMP) and established for the NTHMP Landslide Benchmark Workshop, held in January 2017 at Galveston."

pp. 2 l. 29; "...Multixlayer-HySEA..."

pp.10 l. 163; "...non-conservative hyperbolic system underlying system..."

pp. 21 l. 278; "Tesla P100 GPU In can be.."

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