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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "An efficient two-layer landslide-tsunami numerical model: effects of momentum transfer validated with physical experiments of waves generated by granular landslides" *by* Martin Franz et al.

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Major Points:

-Point-0, L37-43: As also suggested by Anonymous Referee #2, a more detailed discussion about models based on RANS equations (Reynolds averaged Navier-Stokes equations) will be provided. The enhancement of this discussion will also clarify what we call "full-3D". A more appropriate term will be used. Nevertheless, while this paragraph will be more detailed to better capture the context, we won't present in detail the

pros and cons of each approach.

-Point-1, Abstract and L43-44: The additional discussion based on the RANS equations (Point-0) will present approaches against which our model (or shallow water equations model) can be compared in terms of computational efficiency. This will be also more objective as we will detail more precisely the used computer resources, the computation time of typical run, cell size, etc., as suggested by Anonymous Referee #2. It is true that the efficiency comes second after reproducing the phenomenon adequately but a good compromise between those two constrains is the focus of this study. We think that we have shown in the paper the ability of our model to reproduce physical experiments sufficiently well. We will describe the balance between efficiency and "correctness" with more detail.

Point-2, Section 3.1.3: We will rename our approach as "rigid (discrete) collision" as the term "perfectly elastic" is misleading. Moreover, as only the velocity is exchanged (no change in mass and no deformation), in a very simple way, the approach remains very simple. First: The "traditional approach", i.e. transferring the momentum through drag forces, is in fact applied using different sets of equations (or different level of complexity) in literature, thus not so traditional. Moreover, it is relatively not well suited in free surface models. Concerning the undesired user-defined coefficient, the number of coefficient is often relatively important. For instance, Kelfoun, K., Giachetti, T. & Lazabazuy, P. (2010). Landslide-genrated tsunami at Téunion Island. J. Geophys. Res., 115. : 2 coefficients ; Xiao, L., Ward, S. & Wang, J. (2015). Tsunami Squares Approach to Landslide-Generated Waves: Application to Gongjiafang Landslide, Three Gorges Reservoir, China. Pure Appl. Geophys., 172, 3639-3654. : 2 coefficients. Our model indeed requires some manual adjustment through the FS, but it should be performed automatically in a close future. Second: The figure 2 will be improved. And a more advanced discussion will be provided. Finally: The description of the figure will be improved.

Point-3, L235: The figures 3 and 4 will be better described. The description of the

generation will be added.

Point 4, L268-272: we will add discussion about the effects of the velocity and the landslide thickness on the momentum transfer through a sensibility analysis for instance.

Point-5, L344: We agree that the discussion about the run-up was relatively poor. We will discuss more precisely the results and quantify of the discrepancies together with a discussion about the potential causes of these problems.

Minor points: All the suggested corrections and Improvements will be done.

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