

Three-dimensional runup due to submerged and subaerial landslides

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A large set of numerical experiments are designed to examine the maximum runup generated by 3D submerged and subaerial, solid body landslides. A depth-integrated numerical model is utilized, allowing for the efficient simulation of landslides in shallow and intermediate water. Six dimensionless parameters are introduced: the slide thickness, the slide wavenumber, a slide shape parameter, the horizontal aspect ratio of the slide, the specific gravity of the slide mass, and the slope of the beach. Six sets of simulations are first presented, wherein one of the six dimensionless parameters are singularly varied. This allows for the identification of parameter dependence on maximum runup. After combining the dependencies, a number of relationships appear. Most notably, a very clear division between the near and far field is observed. For submerged slides, a non-dimensional estimation of the maximum runup just landward of the slide results, as well as the location and magnitude of the secondary runup peak. This secondary peak is due to the propagation of edge waves, and is in some cases larger than the peak immediately landward of the slide. The results presented in this paper may be useful for preliminary hazard assessment, where a simple and quick estimation of the maximum runup height and locations are required. Additionally, the formulas developed will be particularly beneficial to those developing 3D landslide experiments.