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Landslide tsunamis, from origin to hazard, an overview from the SLATE project

Finn Løvholt[1], Matthias Rauter[1], Thomas Zengaffinen-Morris[2], and Carl Harbitz[1]
[1]NGI, Computational Geomechanics, Oslo, Norway
[2]Oslo, Norway

Landslide tsunamis, despite their importance for the overall tsunami hazard, is not as well understood as earthquake tsunamis. Several uncertain factors contribute to the lack of understanding, such as the variability in the source mechanisms, the dynamics of the landslide and the tsunami generation, as well as the temporal probability of occurrence of landslide events. Here, we present an overview of research activities on landslide tsunami analyses in the H2020 ITN-SLATE project. This research originates from two PhD student projects within SLATE, which have so far resulted in at least six publications with several more in the pipeline. In the SLATE project, we show that both translational and rotational dynamic attributes of the landslide are good indicators of the tsunamigenic potential of slumps using the visco-plastic landslide model BingClaw, by correlating the acceleration times mass and also angular momentum with the induced tsunami height. Moreover, we have employed Navier-Stokes simulations to hindcast model experiments of subaerial landslide tsunamis. By using the experience modelling this benchmark to model tsunamis in many other geometrical settings, the Navier-Stokes model is further employed to test generality and discuss several existing parametric relationships from literature so far available only empirically. New 3D formulations for granular landslide dynamics have further been established. Numerical models have also been set up to simulate real cases such as Anak Krakatoa. Finally, a broad parametric study that constrain the landslide dynamics for a landslide probabilistic hazard analysis is undertaken, to show how using past observations can effectively reduce uncertainties related to landslide dynamics. Combining an overview of the study with some highlights, we show how SLATE has contributed to increasing our understanding of landslide tsunamis and their hazard. We also discuss how the outcome of this project provides a platform for further research. This work has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 721403.