Effects of rotational submarine slump dynamics on tsunami-genesis – new insights from idealized models and the 1929 Grand Banks event

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Tsunamis are natural hazards that can be caused by submarine landslides. Landslides with short runout and duration are called slumps, and their tsunami generation have commonly been modelled simplistically by using blocks. The block approach was used for modelling tsunamis of important historical events such as the 1998 Papua New Guinea (PNG) and the 1929 Grand Banks. While such a method has the advantage of being simple to use, it offers no or little insight into physical processes like ductile deformation of the sediments during the slump motion. Here, we use a viscoplastic landslide model with Herschel-Bulkley rheology to model the deformable sediments on a simplified geometry. The sediment's yield strength is an important factor for the tsunami-genesis, and the resulting translational kinematics relate to the tsunami height as studies for long run-out landslides have already shown. In this study, we also show the importance of the rotational slump motion related to the tsunami-genesis, for the first time, by using a deformable slump. In addition to the idealized study, we use the same viscoplastic model to simulate the 1929 Grand Banks event under consideration of the updated slump source representation. The size of the tsunami simulated for the Grand Banks event modelling confirms that our viscoplastic model can be used for complex slump induced tsunamis. On the other hand, more work is needed to understand the exact generation mechanism.