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Tsunami generation due to submerged blocks and deformable landslides involving retrogression

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Enormous, fully submerged submarine landslides exhibiting volumes ranging from a few to more than thousands of km3 may cause tsunamis with widespread effects, mobilizing their mass at large distance over a gently sloping seabed. During their long run-out, the landslides will deform, and commonly involve a time dependent mass mobilisation (retrogression). The size of the landslide will be of importance for the tsunami generation. Equally important however, is the landslide kinematics. Here, we first review how basic landslide kinematics such as velocity, run-out, and acceleration govern the tsunami generation for a block shaped landslide. Furthermore, we present simulations of tsunamis due to a series of blocks involving a retrogressive mass mobilisation, demonstrating how retrogression influence the wave-height and length for different parameter combinations such as the landslide volume and retrogressive release rate. Here, a retrogressive landslide model is to simulate the retrogressive landslide evolution. An example of tsunami generation due to a deformable landslide based on a fluid model is also given. In both cases, we demonstrate how the tsunamigenesis compares with simple block models that assume a simultaneous release, and discuss how sensitivity to landslide parameters may influence their tsunamigenic strength.