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## Tsunamigenesis Revisited

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When modelling tsunamis and assessing tsunami hazard, it is frequently necessary to make simplifying assumptions in order to reduce the problem to one which is computationally tractable within a reasonable period of time. In this paper, we examine the key factors controlling the generation of the initial sea surface wave and present a series of clear and simple guidelines for real-world problems. We also provide number of computational resources (a tsunami loader) which may be utilised with existing tsunami propagation codes (e.g. COMCOT) to modify the initial sea-surface way, where necessary.

Most tsunami modelling codes operate under the assumption that the initial sea surface wave is identical to the seafloor perturbation. Yet this is only true for large tsunami sources (Kajiura 1963). With our tsunami loader we model the tsunamigenesis process and the formation of the initial sea-surface wave. Critically, the diffusive effect of the water column above the deforming seafloor is accurately addressed, which can result in a substantial decrease in the energy in the initial sea-surface wave.

For example, let us consider a rectangular uplifting patch on the seafloor, at a depth of 4km. For a 4x4km square patch, the diffusive effect will result in an energy reduction of 90%. Even if one of those dimensions is 100 times larger, such that we have a relatively large 400x4 km uplifting region, the energy reduction is still 70%. We find the shortest dimension of the uplifting patch provides a strong control on the energy of the initial sea-surface wave, and consequential tsunami. If we move to a 40x40 km square patch we find the reduction is now 20%, and 400x40 km patch is now a relatively modest, but non-negligible 12%.

We also include other effects such as the time-dependence of seafloor deformation, which also reduces the potential tsunami energy, and horizontal advection of topography, which conversely increases the potential tsunami energy, in our analysis of the tsunamigenesis process. Currently implemented for fault sources, we are working to include landslide and volcanic sources.

