How Fine is Fine Enough? Convergence Study of an ANUGA Inundation Model.

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Selection of computational mesh resolution is rarely discussed in tsunami modelling literature; yet the impact of mesh resolution upon tsunami model results can be considerable. To address this issue, a 2D convergence study was conducted in ANUGA using data from the Okushiri Island tsunami wavetank experiment[1].

The 1/400 scale wavetank data was first up-scaled to "true-scale" and verified in preparation for the convergence study. Ten models of varying mesh resolution were then simulated and compared in both temporal and spatial domains. For the purpose of this convergence study, the finest mesh resolution is assumed to represent the optimal solution and was used as a benchmark for comparison in both domains.

Time series were exported at 26 locations, for three of which, observed measurements from the wavetank experiment were also available for comparison. The L2 norm versus mesh resolution was plotted for each location, providing a measure of the numerical convergence. To understand spatial variation in mesh performance, maximum depth grids for all 10 models were compared across the entire computational domain.

In this presentation I will demonstrate that ANUGA is scaleable and achieves first order convergence. I will also show that investigating convergence spatially in addition to in the time domain, as is traditional, can provide valuable information about the spatial variation in mesh performance, which can in turn highlight areas in the model of greatest sensitivity to mesh resolution.

[1] The Okushiri Island tsunami wavetank experiment is a benchmark problem from the Third International Workshop on Long-Wave Runup Models, held at the Wrigley Marine Science Centre, Catalina Island, California, on 17-18 June 2004.