Geological Events and Tsunami Simulations: Symbiosys and Sensitivities

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Abstract

Tsunami simulations have had a troubled history reproducing the wave observations and data of real events. One numerical model and one application technique (involving extensive geological inputs) has been able to reproduce all wave observations and wave data for every historical case study performed to date. Why does such a troubled history persist? A number of distinct factors have been proposed to explain discrepancies including: geological uncertainty, discounting eyewitnesses, wave equations, grid size, runup algorithm, and missing near shore bathymetry, among others. Given the number of factor in play, confusion currently exists as to what matters, and what doesn't matter. A number of historical case studies will demonstrate the kind of geological information needed to run accurate tsunami simulations. Specific examples using the 4th order Boussinesq wave model Geowave will highlight the complexity of wave mechanics for almost all events. Eyewitnesses usually provide accurate reports according to simulation results. Nonlinear shallow water wave equations are not always applicable to tsunamis. Grid sizes need to be remarkably small to capture wave runup. Issues related to runup algorithms and nearshore bathymetry do not seem to be of general importance.