



Sequencing of tsunami waves: Why the first wave is not always the largest

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In many instances, the largest wave to hit a coastline during a tsunami is not the first one. Classical examples include the arrivals of the 1960 Chilean tsunami in Hilo, Hawaii, and of the 1964 Alaskan tsunami in Crescent City, California, where most casualties took place during later arrivals. This situation can be socially treacherous, since residents and civil defense authorities are led to believe that the worst is over after a first, relatively mild arrival, and to give an early "all clear" before the true largest wave, as was the case in Papeete, Tahiti during the 2011 Tohoku tsunami.

We research this problem by using a number of simple models for which analytical solutions are available, as well as more realistic simulations of the large earthquake tsunamis of the past decade, and compare their results to a catalog of waveforms obtained at DART buoys spread over the Pacific Basin. Preliminary results indicate a transition from a regime of Maximum First Wave to one of Delayed Maximum when distance is increased, azimuth to receiver is moved away from the normal to fault strike, and/or source size is reduced.