



A Probabilistic Tsunami Hazard Assessment Methodology

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A methodology for probabilistic tsunami hazard assessment (PTHA) will be described for multiple near- and far-field seismic sources. The method integrates tsunami inundation modeling with the approach of probabilistic seismic hazard assessment (PSHA). A database of inundation simulations is developed, with each simulation corresponding to an earthquake source for which the seismic parameters and mean interevent time have been estimated. A Poissonian model is then adopted for estimating the probability that tsunami flooding will exceed a given level during a specified period of time, taking into account multiple sources and multiple causes of uncertainty. Uncertainty in the tidal stage at tsunami arrival is dealt with by developing a parametric expression for the probability density function of the sum of the tides and a tsunami; uncertainty in the slip distribution of the near-field source is dealt with probabilistically by considering multiple sources in which width and slip values vary, subject to the constraint of a constant moment magnitude. The method was applied to Seaside, Oregon, to obtain estimates of the spatial distribution of 100- and 500-year maximum tsunami amplitudes, i.e., amplitudes with 1% and 0.2% annual probability of exceedance. These results will be presented and discussed, including the primary remaining sources of uncertainty – those associated with interevent time estimates, the modeling of background sea level, and temporal changes in bathymetry and topography. PTHA represents an important contribution to tsunami hazard assessment techniques; viewed in the broader context of risk analysis, PTHA provides a method for quantifying estimates of the likelihood and severity of the tsunami hazard, which can then be combined with vulnerability and exposure to yield estimates of tsunami risk.