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The Role of Earth Science in Oregon's Tsunami Preparedness (Invited)

Details

Meeting	2009 Fall Meeting
Section	Natural Hazards
Session	Extreme Natural Hazards: Risk Assessment, Forecasting, and Decision Support I Posters
Identifier	NH43A-1302
Authors	Priest, G, Newport Coastal Field Office, Oregon Dept. of Geology and Mineral Industries, Newport, OR, United States Real-time and responsive information delivery [1964]
Index	Hydrodynamic modeling [4534]
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Abstract

Earth science played a critical role in understanding the scope of Oregon's tsunami hazard. When in the early 1990's earth scientists communicated to stakeholders the seriousness of the threat posed by local Cascadia subduction zone tsunamis, tsunami preparedness began to rise in priority at all levels of government. Hard field evidence in the form of prehistoric tsunami deposits was a critical component in making the hazard "real" to local governments. State-produced tsunami inundation maps derived from numerical simulations gave decision makers and educators reliable tools to illustrate the spatial scope of the hazard. These maps allowed local cities to plan for evacuation and empowered the State of Oregon to begin "hard" mitigation by limiting new construction of critical facilities seaward of a regulatory inundation line. "Entering" and "Leaving" tsunami hazard zone signs were placed along the Oregon Coast Highway where it dips below this inundation line as means of raising awareness of both the local and transient populations. When detailed inundation studies and derivative evacuation maps were produced for individual communities, State scientists sought advice from local officials at every stage, giving them ownership of the final products. This sense of ownership gave decision makers much greater confidence in the maps and turned many skeptics into passionate advocates. This network of advocates has, over time, resulted in local jurisdictions taking substantive preparedness actions such as replacing critical evacuation bridges, starting networks of emergency response volunteers, and moving critical structures like schools and fire stations. One place that earth science has some difficulty is in communicating probability and uncertainty. For example, the State of

Oregon is currently producing new maps that depict uncertainty of tsunami flooding from a future Cascadia subduction zone earthquake. These maps show a range of inundation lines that reflect the relative confidence level (percentage) that a local Cascadia tsunami will NOT exceed each line. In the first of these studies at Cannon Beach, Oregon (Priest et al., 2009) the 90th percentile flood level was only about half to two-thirds as high as the 99th percentile. On the northern Oregon coast Cascadia recurrence is ~500 years, so a percentile map depicts spatial uncertainty of inundation for that event. A Cascadia tsunami approximating the 99th percentile confidence level is no doubt a rare event, but how rare we really do not know. We suspect from offshore turbidite data that only one of these extreme events may have occurred in the last 10,000 years. When the map and underlying data were presented to local officials, they had some difficulty in understanding how to use the information. Erring on the side of caution, they chose the 99th percentile line for evacuation planning but this decision greatly limited available evacuation sites. Cost may make a similarly conservative decision inappropriate for use in building codes or for design of vertical evacuation structures. REFERENCE Priest, G.R.; Goldfinger C.; Wang, K.; Witter, R.C.; Zhang; Y., Baptista, A.M. (2009) Tsunami hazard assessment of the Northern Oregon coast: a multi-deterministic approach tested at Cannon Beach, Clatsop County, Oregon. Oregon Dept. Geol. Mineral Industries Special Paper 41.

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