TsuInfo Alert

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National Tsunami Hazard Mitigation Program

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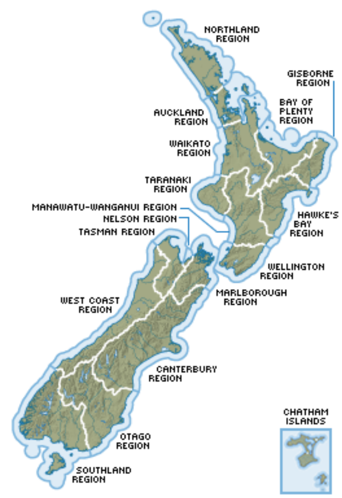
Warning Guidance — Mitigation — Hazard Assessment

New tsunami report a sound basis for mitigation measures

By New Zealand Ministry of Civil Defense & Emergency Management

Recent tsunami research has presented New Zealand with a mixed bag of news. Parts of our coast are exposed to greater tsunami hazard than previously thought, while the hazard in other coastal regions is the same or less. The findings come from a new GNS Science report commissioned by the Ministry for Civil Defence and Emergency Management. It updates a report on New Zealand's tsunami hazards that we compiled in 2005.



This year's report incorporates new research and significant changes in scientific understanding since our 2005 report. It focuses on the entire New Zealand coastline rather than just the main population centres. It also uses more advanced modelling to quantify the tsunami hazard. Areas where the hazard is higher are the North Island's east-facing coasts and the southwest of the South Island. In other coastal regions, the tsunami hazard remains about the same, or has even decreased.

Our recent research and modelling has shown the hazard from near-source tsunami with little travel time is higher than previously estimated. This is particularly the case for tsunami generated by undersea earthquakes off the North Island's east coast.

The 220-page report summarises the historical and geological record of tsunami in New Zealand. It notes that New Zealand has experienced about 10 tsunami of 5m or more since 1840. Focussing on the historical record of dangerous local and regional tsunami - those that take less than three hours to reach here - suggests that these nearby events may occur in New Zealand about every 40 to 50 years on average. So it is likely that at least one will occur in the lifetime of most New Zealanders.

The report is in some respects unique, because of the approach it takes and the level of sophistication in the modelling it uses. It focuses on tsunami hazard – the likely size and frequency of tsunami for given time periods. It does not provide estimates of damage, cost, and casualties. It concludes that over a 2500-year period, earthquake- generated tsunami are the major hazard, ahead of tsunami generated by seafloor landslides or volcanic activity.

(Story continues on page 2)

In this issue:

WASHINGTON STATE DEPARTMENT OF Natural Resources
Peter Goldmark - Commissioner of Public Lands
Division of Geology and Earth Resources
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http://www.dnr.wa.gov/researchscience/topics/geologypublicationslibrary/pages/tsuinfo.aspx

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New tsunami report a sound basis for mitigation measures

By New Zealand Ministry of Civil Defense & Emergency Management

(continued from page 1)

Lessons learned from the 2011 Tohoku tsunami in Japan were an important ingredient in the report. The magnitude 9.0 undersea megathrust Tohoku earthquake was substantially larger than scientists had expected at this location. Another observation was that the rupture between the two tectonic plates at Tohoku was very non-uniform. In some places, the plates moved 50m horizontally and in other places it was as little as 5m.

This has implications for the size of tsunami, as the movement between the plates affects the motion of the seabed. Similar non-uniformities are likely to occur during ruptures of New Zealand's nearby subduction zones and other faults. There is a possibility this non-uniformity could occur if the Hikurangi subduction zone ruptures of the North Island's east coast. Our report attempts to incorporate this phenomenon, the first time this has been tackled at a national level.

To see the full report, please visit the New Zealand Ministry of Civil Defense & Emergency Management's website:

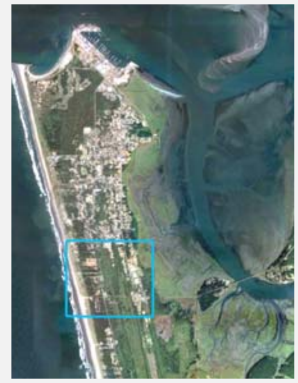
http://tinyurl.com/m79fn8g

IN THE NEWS

Grays Harbor County school to build first U.S. vertical-tsunami refuge

By Sandi Doughton, Seattle Times science reporter

A new scenario for a megaquake and tsunami off the Washington coast warns that the death toll could top 10,000 — but Paula Akerlund is doing everything she can to keep her kids safe. All 700 of them.



Westport, WA, Google Earth image. Blue rectangle is area of tsunami hazard assessment; white circle encompasses Ocosta School campus.

The Grays Harbor County school district Akerlund oversees on the Washington coast is preparing to build the nation's first tsunami refuge.

Residents of Westport, Grayland and other communities in the Ocosta School District approved a $13.8 million bond issue earlier this year to replace a flimsy elementary-school building with a complex that includes a gym strong enough to withstand tsunami surges, tall enough to stay dry and big enough to shelter more than 1,000 people on its roof.

Ocosta Elementary. Credit: Mike Coverdale

"We're probably less than a mile from the Pacific Ocean, and we have no hills to run up or other natural high ground," Akerlund said. "Our only alternative is to get as high as we can, as fast as we can."

See full article in Seattle Times: http://seattletimes.com/html/localnews/2022051420_shakeoutxml.html
See background research by Project Safe Haven:
http://www.emd.wa.gov/hazards/documents/haz_SafeHavenReport_GraysHarbor.pdf

Caribbean Tsunami Information Center (CTIC) director appointed

By Intergovernmental Oceanographic Commission

We are pleased to welcome Ms Alison Brome as Director (a.i.) of the Caribbean Tsunami Information Center (CTIC). Ms Brome has vast experience in project and procurement management, natural hazard assessment, geography, urban planning and research. Ms Brome has also previously served as Technical Coordinator for the Tsunami and Other Coastal Hazards Warning Systems Project, which involved close collaboration with the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the University of West Indies Seismic Research Centre (SRC).

Ms Brome, who started duties on 2nd September 2013, will be based at the Department of Emergency Management (DEM) of the Government of Barbados, responsible for setting up the CTIC. She can be reached at A.Brome@unesco.org

Name change of the West Coast/Alaska Tsunami Warning Center

By Paul Whitmore, NTWC

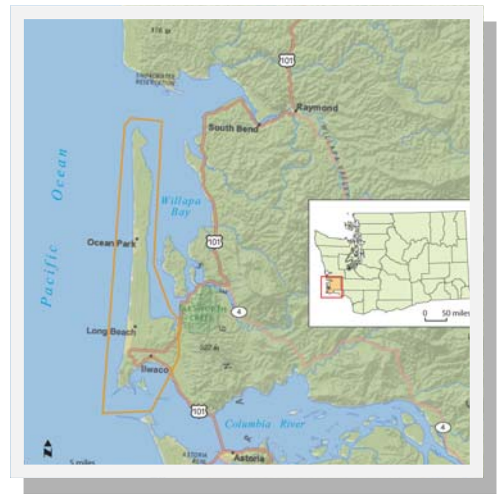
Effective October 1, 2013, the NWS West Coast/Alaska Tsunami Warning Center (WC/ATWC) will be known as the National Tsunami Warning Center (NTWC). The only change to the NTWC product suite will be the Center's name in the Mass News Disseminator (MND) Header. All AWIPS and WMO identifiers will remain the same. The Center's current URL will continue to function: http://wcatwc.arh.noaa.gov

JUST PUBLISHED

Landslide and liquefaction maps for the Long Beach Peninsula, Pacific County, Washington: Effects on tsunami inundation zones of a Cascadia subduction zone earthquake

By Stephen L. Slaughter, Timothy J. Walsh, Anton Ypma, Kelsay M. D. Stanton, Recep Cakir, and Trevor A. Contreras, Washington Division of Geology and Earth Resources

The Washington Division of Geology and Earth Resources (WADGER) participates in the National Tsunami Hazard Mitigation Program to assess tsunami hazards along the Washington coast, particularly those generated by nearby faults such as the Cascadia subduction zone (CSZ). Currently, many coastal communities have tsunami evacuation routes and assembly areas based on mapping of potential inundation areas from a tsunami initiated by a CSZ earthquake on the Washington coast (WADGER, 2007a,b, 2012; Walsh and others, 2000, 2002a,b, 2003, 2005). These evacuation routes and evacuation areas had not been compared to areas of potential ground failure that could initiate from a CSZ earthquake. Earthquake-induced ground failures could adversely affect tsunami evacuation by blocking or damaging evacuation routes, potentially rendering them impassable, or impeding an efficient and rapid vehicular evacuation. We have concentrated part of our technical program on earthquake-induced ground failures, including soil liquefaction and landslides, in order to improve evacuation planning for tsunamis that would inundate coastal areas in less than an hour after earthquake ground shaking. This report assesses the earthquake-induced ground failure potential for the communities of Long Beach, Ocean Park, and Ilwaco on the Long Beach Peninsula in Pacific County, Washington (Fig. 1). A tsunami wave as high as 30 feet is expected to reach this area with 30 minutes of the quake (WADGER, 2007a). Note that the peninsula is officially named the North Beach Peninsula; however, it is locally and commonly referred to as the Long Beach Peninsula, and we opt to follow the colloquial trend. We consider here both soil liquefaction and landslide initiation.



The probability of soil liquefaction increases with the duration of shaking (Seed and Idriss, 1982; Seed and others, 2003), and slopes that are stable under static conditions may fail under large ground accelerations (Keefer, 1984; Jibson and others, 1998). A CSZ event may produce up to a magnitude (M) 9+ earthquake (Satake and others, 2003) and would produce ground accelerations on the Washington coast of as much as 0.40 *g* (*g* is the acceleration due to gravity) and shaking durations of as much as several minutes (Art Frankel, U.S. Geological Survey, written commun., 2008), more than sufficient to initiate soil liquefaction and shallow landslides. Soil liquefaction can damage transportation networks, such as roads and bridges (Seed and others, 2003), and landslides, even very small landslides, can render a road impassable to automobiles. These ground failures can complicate or prohibit vehicular evacuation as well as hamper emergency response and recovery efforts.

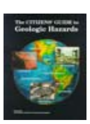
The objective of this report is to assist city and emergency management officials in evaluating the suitability of existing evacuation routes and assembly areas for potential vulnerability to ground failure from a M9+ CSZ earthquake. Results of this report could necessitate modifying, adding, or removing current evacuation routes and assembly areas.

See full report: http://www.dnr.wa.gov/publications/ger_ri37_longbeach_liquefaction.zip

HISTORICAL TSUNAMIS

WORLDS MAJOR TSUNAMIS

Year	Origin	Damage site(s)	Losses
1628	BC Santorini eruption	Crete, Greece, Egypt	Minoan civilization devasted
1640	Komagatake Volcano	Hokkaido, Japan	1,460 deaths
1707	West Pacific earthquake	Osaka Bay, Japan	4,900 deaths
1755	Lisbon earthquake	Western Europe, N. Africa	20,000 to 30,000 deaths
1792	Unzen Volcano	Kyushu, Japan	10,000 deaths (the landslide killed 5,000 more)
1812	Santa Barbara, CA	Santa Barbara, CA	30-ft. high waves were reported
1815	Tambora eruption	Indonesia	10,000 deaths
1868	Peru/Chile earthquake	Hilo, Hawaii	30-ft. high waves carried boats 2 miles inland
1883	Krakatau eruption	Indonesia	36,000 deaths; waves more than 100 ft. high
1896	Honshu earthquake	Sanriku, Japan	27,000 deaths
1905	Norway, landslide into fjord	Loen Lake, Norway	61deaths
1908	Messina, Italy earthquake	Straights of Messina	70,000-100,000 deaths estimated
1918	Philippines landslide	Philippines	100 deaths
1933	Honshu earthquake	Sanriku, Japan	3,000 deaths; waves were 75 ft. high
1936	Norway, landslide into fjord	Loen Lake, Norway	73 deaths
1946	Aleutian Islands earthquake	Wainaku, Hawaii	173 deaths; waves were 55 ft. high
1960	Chile earthquake	Chile, Hawaii, Japan	1,900 deaths
1964	Alaska earthquake	Crescent City, CA; Valdez, AK	122 deaths
1971	Peru	Chungar, Peru	600 deaths
1976	West Pacific earthquake	Philippines	3,000 deaths
1979	Werung Volcano	Lomblem Island, Indonesia	539 deaths
1992	Nicaragua earthquake	Masachapa	116 deaths; waves were 30 ft. high
1998	Papua New Guinea	Papua New Guinea	2,200 deaths
2004	Sumatra, Indonesia earthquake	South Asia & East Africa	228,000 deaths
2010	Indonesia	Indonesia	450 deaths
2011	Tokyo, Japan	Japan	16,000 deaths



Sources: American Institute of Professional Geologists, 1993, The citizens' guide to geologic hazards--A guide to understanding geologic hazards, including asbestos, radon, swelling soils, earthquakes, volcanoes, landslides, subsidence, floods, and coastal hazards: American Institute of Professional Geologists, p. 115. ; CNN Library, 2013, Tsunamis Fast Facts: CNN World website. [*Accessed October 2013* http://www.cnn.com/2013/08/20/world/tsunamis-fast-facts/]

UNESCO working team to document facts of 1945 earthquake and tsunami meets

By Oman Observer

MUSCAT — Meeting of the United Nations Educational, Scientific and Cultural Organisation (Unesco) Working Team to Document Facts of 1945 Earthquake and Tsunami began yesterday and will continue until October 24. The Public Authority of Civil Aviation (PACA), represented by the Directorate-General of Meteorology and Air Navigation (DGMAN) organised the meeting, in cooperation with the Unesco and the Intergovernmental Oceanographic Commission (IOC) with the participation of India, Pakistan and Iran. Representatives from the Sultan Qaboos University (Earthquakes Monitoring Centre), National Records and Archives Authority (NRAA) and Ministry of Education (Oman National Commission for Education, Culture and Science) participate in the meeting.

See full article: http://main.omanobserver.om/?p=23032

SCIENCE OF TSUNAMI HAZARDS

Articles from *Science of Tsunami Hazards v.32 #4*

Journal of Tsunami Society International

Methods for the estimation of tsunami risk along Russia's Far East 212 By G.V. Shevchenko, D.E. Zolotukhin, and I.N. Tikhonov

ABSTRACT: A simplified method was developed for estimating the tsunami risk for a coast for possible events having recurrence periods of 50 and 100 years. The method is based on readily available seismic data and the calculation of magnitudes of events with specified return periods. A classical Gumbel statistical method was used to estimate magnitudes of small probability events. The tsunami numerical modeling study used the average earthquake coordinates in the Kuril-Kamchatka high seismic area. The verification and testing of the method were carried out using events from the North, Middle and South Kuril Islands – the most tsunami-risk areas of Russia's Far East. Also, the study used the regional Kuril-Kamchatka catalogue of earthquakes from 1900 to 2008 - which included earthquakes with magnitudes of at least M=6. The results of the study indicate that the proposed methodology provides reasonable estimates of tsunami risk.

Late Holocene tsunami deposits at Salt Creek, Washington, USA By Ian Hutchinson, Curt D. Peterson, and Sarah L. Sterling

ABSTRACT: We interpret two thin sand layers in the estuarine marsh at Salt Creek, on the southern shore of the Strait of Juan de Fuca, as the products of tsunamis propagated by earthquakes at the Cascadia subduction zone. The sand layers extend for about 60 m along the left bank of the creek about 800 m from the mouth, and can be traced to the base of a nearby upland area. One layer is exposed in the creek bank about 400 m further upstream, but they are only patchily distributed in the rest of the central area of the marsh. Both layers contain brackish-marine epipsammic diatoms. The lower sand layer marks a sharp contact between intertidal peaty mud and overlying mud, perhaps reflecting modest coseismic subsidence in association with tsunami deposition, but little or no change in the bracketing sediment occurs in association with the upper sand layer. The ages of the sand layers are not closely constrained, but were most likely deposited by tsunamis generated by great earthquakes at the Cascadia subduction zone about 1650 and 1300 years ago. The Cascadia great earthquake of AD1700 may have induced slight subsidence in the marsh, but no tsunami deposit was detected at the inferred contact. The absence of deposits from the marsh immediately inland of the 4 m-high barrier beach indicates that the largest tsunamis in the late Holocene at this site have not overtopped the barrier, which suggests that these tsunamis were likely only 2-3 m high.

A critical review and evaluation of applying semi-volatile organic compounds (SVOCs) as geochemical tracer to indicate tsunami backwash By Siwatt Pongpiachan and Klaus Schwarzer

ABSTRACT: Tsunamis symbolize one of the most harmful natural disasters for low-lying coastal zones and their residents, due to both its destructive power and irregularity. The 2004 Boxing Day tsunami, which attack the Andaman Sea coast of Thailand, resulted 5,395 of deaths and inestimable casualties, interrupted economies and social well-being in numerous coastal villages and caused in extreme alterations of both onshore and offshore coastal morphology. The Great Indian Ocean tsunami also highlighted that there are many missing jigsaw puzzle pieces in scientific knowledge, starting from the generating of tsunamis offshore to the countless influences to the marine ecosystems on the continental shelf, coastal areas and on land and to the economic and social systems consequences. As with all deposits that do not have a direct physical link to their causative sources, marine tsunami deposits must be distinguished from other deposits through regional correlation, dating and criteria for recognition within the deposits themselves. This study aims to provide comprehensive reviews on using Polycyclic Aromatic Hydrocarbons (PAHs) as a chemical proxy to discriminate tsunami related deposits from typical marine sediments. The advantages and disadvantages of this chemical tracer will be critically reviewed and further discussed.

View journal online: http://tsunamisociety.org/OnlineJournals13.html