TsuInfo Alert

prepared by the Washington State Department of Natural Resources on behalf of the
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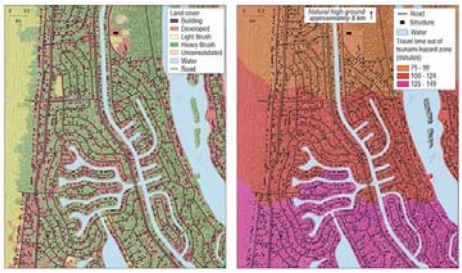
Getting out of harm's way: Evacuation from tsunamis

U.S. Geological Survey News Release: September 16th, 2014
By Leslie Gordon

Scientists at the U.S. Geological Survey have developed a new mapping tool, the Pedestrian Evacuation Analyst, for use by researchers and emergency managers to estimate how long it would take for someone to travel on foot out of a tsunami-hazard zone. The GIS software extension, released this week, allows the user to create maps showing travel times out of hazard zones and to determine the number of people that may or may not have enough time to evacuate. The maps take into account the elevation changes and the different types of land cover that a person would encounter along the way.



Landcover map (left) and pedestrian evacuation time estimate map (right) Ocean Shores, WA.

Maps of travel time can be used by emergency managers and community planners to identify where to focus evacuation training and tsunami education. The tool can also be used to examine the potential benefits of vertical evacuation structures, which are buildings or berms designed to provide a local high ground in low-lying areas of the hazard zone.

The Pedestrian Evacuation Analyst software can assist communities with tsunami planning by answering questions such as:

- How long could it take for people to evacuate out of tsunami-hazard zones?
- Will people have enough time to evacuate before the first tsunami waves arrive?
- If people don't have enough time to evacuate, then where could vertical-evacuation refuges provide high ground?
- How do you compare the benefits of multiple sites for potential vertical-evacuation refuges?

"The tool can be used to provide valuable decision support for tsunami evacuation planning and vertical evacuation siting, which is just in the beginning stages in the U.S. Pacific Northwest," said Jeanne Jones, USGS geographer who led the development of the software tool. The tool has enabled USGS researchers to better understand various aspects of community vulnerability to tsunamis, including community comparisons based on evacuation times, vertical-evacuation decision support, the impact of post-tsunami recovery decisions, and the evacuation challenges posed by different types of tsunami threats.

The software tool can be downloaded online, and the complete users guide, "The pedestrian evacuation analyst—Geographic information systems software for modeling hazard evacuation potential" is also available online.

See press release: http://www.usgs.gov/newsroom/article_pf.asp?ID=4002
Link to Pedestrian Evacuation Analyst: http://geography.wr.usgs.gov/science/vulnerability/

In this issue:

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Division of Geology and Earth Resources
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NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:
http://69.63.217.22/D92019/OPAC/Index.aspx

National Tsunami Hazard Mitigation Program
Annual meeting and benchmarking workshop February 9th–13th, 2015

By Rocky Lopes, NOAA/National Weather Service Tsunami Program

The National Tsunami Hazard Mitigation Program (NTHMP) will be holding its annual meeting in Portland, Oregon, in early 2015 . The meeting will be held in the Oregon State Office Building, courteously hosted by the Oregon Department of Geology and Mineral Industries.

The NTHMP annual meeting will be preceded by a two-day benchmarking workshop, sponsored by the NTHMP Mapping & Modeling Subcommittee, on Monday–Tuesday, February 9–10.

Half-day meetings of the NTHMP Mitigation & Education Subcommittee and the NTHMP Warning Coordination Subcommittee will occur on February 10.

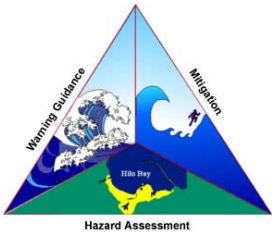
The NTHMP Annual Meeting will be held February 11–12. The NTHMP Coordinating Committee will meet one-half day on the morning of February 13.

If you are interested in more information about these meetings, or to register, please visit:

http://nws.weather.gov/nthmp/2015annualmeeting/index.html

Please direct any questions to Rocky Lopes, NTHMP Administrator, at Rocky.Lopes@noaa.gov.

We look forward to a lively and productive series of meetings.



PROJECT UPDATES

Next draft of proposed TsunamiReady® Guidelines available for review

By Rocky Lopes, NOAA/National Weather Service Tsunami Program

During July and August 2014, TsunamiReady® Guidelines Project co-leaders Troy Nicolini and Rocky Lopes received more than 80 comments, suggestions, and ideas related to the proposed new TsunamiReady® Guidelines derived from a social science report completed by Dr. Chris Gregg and team.

Lopes prepared a draft copy of the proposed guidelines which included everyone's comments. Nicolini and Lopes reviewed those comments and prepared for a robust three-hour discussion during the National Tsunami Hazard Mitigation Program (NTHMP) summer meeting held August 19th, 2014 in Seattle, Washington. During that workshop, feedback was received regarding consolidation, reorganization, and restructuring of some of the proposed guidelines.

Nicolini and Lopes took all comments very seriously. When they returned from the NTHMP summer meeting, they made significant changes and improvements to the proposed TsunamiReady® Guidelines to address the concerns, issues, and suggestions they heard.

Highlights of the changes include:

- Kept content categories related to familiar phases of emergency management, but reordered them to start with material similar to, and consistent with, the TsunamiReady® Guidelines in place since 2001.
- Combined similar and like-focused recommendations.
- Reordered some TsunamiReady® Guidelines to join content and help with logical flow.
- Included a suggested two-tiered approach to first accommodate and recognize counties and communities that have (or can) meet fundamental requirements related to tsunami preparedness, planning, mitigation, and warning capabilities, and second to add long-term mitigation and recovery capabilities .

The next draft of the proposed TsunamiReady® Guidelines which address the major concerns has been developed. This document is now in an open comment period and is posted on this web page: http://nws.weather.gov/nthmp/tr/.

Anyone with an interest in the TsunamiReady® Program is invited to review this next draft of the Guidelines and mark it with comments (REVIEW tab => New Comment) or edits. If you suggest edits, please have "Track Changes" turned on.

One word of caution: remember that we can't figure out how new Guidelines will be implemented (the implementation plan, including grandfathering) until we know what the new Guidelines will be. Try to avoid providing comments or questions about implementation. Think "Guidelines". More discussion will follow about implementation steps.

Thank you for your help and support,

Troy Nicolini & Rocky Lopes
TsunamiReady® Guidelines Project Team

Questions? Contact Rocky Lopes by email (Rocky.Lopes@noaa.gov) or phone (301)713-1858 x114.

For more information, visit: http://nws.weather.gov/nthmp/tr/

PROJECT UPDATES

Plan update to guide national tsunami education and outreach efforts

By Christa Rabenold, NOAA/National Weather Service Tsunami Program

In September, the National Tsunami Hazard Mitigation Program (NTHMP) Coordinating Committee accepted an update to the 2011 National Tsunami Education and Outreach Plan of Action. The plan update was prepared by the NOAA Tsunami Program (National Weather Service Headquarters—NWS/HQ) with assistance from a workgroup composed of members of the NTHMP Mitigation and Education Subcommittee. As an update, it aims to fill gaps and meet needs previously identified and supports and builds on the work initiated under the 2011 plan.

The plan update includes education and outreach projects to support state and local agencies' ability to increase tsunami awareness and preparedness. Projects include an NTHMP fact sheet, evacuation modeling guidance, national-level support for state and local Tsunami Preparedness Week efforts, and fact sheets that communicate how the Federal Emergency Management Agency's Community Rating System can enhance tsunami mitigation and support efforts to achieve TsunamiReady recognition.

Most of the projects identified in the plan update will be implemented by contract staff supporting the NOAA Tsunami Program (NWS/HQ). These staff will work collaboratively with NTHMP partners and other experts, as appropriate, to help achieve the visions of the NTHMP and the NOAA Tsunami Program.

The plan update is available online at http://nws.weather.gov/nthmp/documents/2014edplan.pdf

Tsunami evacuation signage installation on Kauai complete

By Kevin J. Richards, Hawaii Emergency Management Agency

With help from a grant from the National Tsunami Hazard Mitigation Program (NTHMP), 128 new tsunami signs were installed on the Hawaiian Island of Kauai. The evacuation route and evacuation zone demarcation sign project was officially completed and blessed on September 23, 2014. Mayor Bernard P. Carvalho Jr. and other state and county officials commemorated the official completion of the project at a tsunami evacuation route sign location near Wailua Beach, Kauai. The signs mark evacuation routes and the start/end of evacuation zones to help residents and visitors safely exit evacuation zones in the event of a tsunami warning. NTHMP grant funding for this project is managed by Hawaii Emergency Management Agency, formerly the State Civil Defense.

Commemoration of evacuation zone demarcation near Wailua Beach, Kauai, Hawaii. CREDIT: Brian Miyamoto, Hawaii Emergency Management Agency.

RECENTLY PUBLISHED

Tsunami research

Performance Benchmarking Tsunami Models for NTHMP's Inundation Mapping Activities: By Juan Horrillo; Stéphan T. Grilli; Dmitry Nicolsky; Volker Roeber; Joseph Zhang; *Pure and Applied Geophysics, July 2014*.

Abstract: The coastal states and territories of the United States (US) are vulnerable to devastating tsunamis from near-field or far-field coseismic and underwater/subaerial landslide sources. Following the catastrophic 2004 Indian Ocean tsunami, the National Tsunami Hazard Mitigation Program (NTHMP) accelerated the development of public safety products for the mitigation of these hazards. In response to this initiative, US coastal states and territories speeded up the process of developing/enhancing/adopting tsunami models that can be used for developing inundation maps and evacuation plans. One of NTHMP's requirements is that all operational and inundation-based numerical (O&I) models used for such purposes be properly validated against established standards to ensure the reliability of tsunami inundation maps as well as to achieve a basic level of consistency between parallel efforts. The validation of several O&I models was considered during a workshop held in 2011 at Texas A&M University (Galveston). This validation was performed based on the existing standard (OAR-PMEL-135), which provides a list of benchmark problems (BPs) covering various tsunami processes that models must meet to be deemed acceptable. Here, we summarize key approaches followed, results, and conclusions of the workshop. Eight distinct tsunami models were validated and cross-compared by using a subset of the BPs listed in the OAR-PMEL-135 standard. Of the several BPs available, only two based on laboratory experiments are detailed here for sake of brevity; since they are considered as sufficiently comprehensive. Average relative errors associated with expected parameters values such as maximum surface amplitude/runup are estimated. The level of agreement with the reference data, reasons for discrepancies between model results, and some of the limitations are discussed. In general, dispersive models were found to perform better than nondispersive models, but differences were relatively small, in part because the BPs mostly featured long waves, such as solitary waves. The largest error found (e.g., the laboratory experiment case of a solitary wave on a simple beach) was 10 % for non-breaking wave conditions and 12 % for breaking conditions; these errors are equal or smaller than the thresholds (10 % and 20 %, respectively) defined by the OAR-PMEL-135 for predicting the surface profile; hence, all models examined here are deemed acceptable for inundation mapping purposes.

Link to article: http://link.springer.com/article/10.1007/s00024-014-0891-y

Paleotsunami evidence on Kaua'i and numerical modeling of a great Aleutian tsunami: By Rhett Butler; David Burney; David Walsh, *Geophysical Research Letters, Oct. 2014.*

Abstract: The Hawaiian Islands' location in the middle of the Pacific Ocean is threatened by tsunamis from great earthquakes in nearly all directions. Historical great earthquakes Mw > 8.5 in the last 100 years have produced large inundations and loss of life in the islands but cannot account for a substantial (≤ 600 m3) paleotsunami deposit in the Makauwahi sinkhole on the Island of Kaua'i. Using high-resolution bathymetry and topography we model tsunami inundation of the sinkhole caused by an earthquake with a moment magnitude of Mw ~9.25 located in the eastern Aleutians. A preponderance of evidence indicates that a giant earthquake in the eastern Aleutian Islands circa 1425–1665 A.D.—located between the source regions of the 1946 and 1957 great tsunamigenic earthquakes—created the paleotsunami deposit in Kaua'i. A tsunami deposit in the Aleutians dated circa 1530–1660 A.D. is consistent with this eastern Aleutian source region.

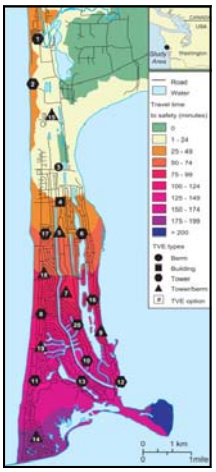
Link to article: http://onlinelibrary.wiley.com/doi/10.1002/2014GL061232/abstract

RECENTLY PUBLISHED

Tsunami research

Tsunami vertical-evacuation planning in the U.S. Pacific Northwest as a geospatial, multi-criteria decision problem: By Nathan Wood; Jeanne Jones; John Schelling; Mathew Schmidtlein, *International Journal of Disaster Risk Reduction, Sept. 2014.*

Abstract: Tsunami vertical-evacuation (TVE) refuges can be effective risk-reduction options for coastal communities with local tsunami threats but no accessible high ground for evacuations. Deciding where to locate TVE refuges is a complex risk-management question, given the potential for conflicting stakeholder priorities and multiple, suitable sites. We use the coastal community of Ocean Shores (Washington, USA) and the local tsunami threat posed by Cascadia subduction zone earthquakes as a case study to explore the use of geospatial, multi-criteria decision analysis for framing the locational problem of TVE siting. We demonstrate a mixed-methods approach that uses potential TVE sites identified at community workshops, geospatial analysis to model changes in pedestrian evacuation times for TVE options, and statistical analysis to develop metrics for comparing population tradeoffs and to examine influences in decision making. Results demonstrate that no one TVE site can save all at-risk individuals in the community and each site provides varying benefits to residents, employees, customers at local stores, tourists at public venues, children at schools, and other vulnerable populations. The benefit of some proposed sites varies depending on whether or not nearby bridges will be functioning after the preceding earthquake. Relative rankings of the TVE sites are fairly stable under various criteria-weighting scenarios but do vary considerably when comparing strategies to exclusively protect tourists or residents. The proposed geospatial framework can serve as an analytical foundation for future TVE siting discussions.



Study area map of Ocean Shores, Washington, including modeled pedestrian travel times to safety, vertical-evacuation sites proposed during Project Safe Haven meetings, and regional map.

Link to article: http://www.sciencedirect.com/science/article/pii/S2212420914000387

A protocol for coordinating post-tsunami field reconnaissance efforts in the USA: By Rick Wilson; Nathan Wood; Laura Kong; Mike Shulters; Kevin Richards; Paula Dunbar; Gen Tamura; Ed Young, *Natural Hazards, Sept. 2014.*

Abstract: In the aftermath of a catastrophic tsunami, much is to be learned about tsunami generation and propagation, landscape and ecological changes, and the response and recovery of those affected by the disaster. Knowledge of the impacted area directly helps response and relief personnel in their efforts to reach and care for survivors and for re-establishing community services. First-hand accounts of tsunami-related impacts and consequences also help researchers, practitioners, and policy makers in other parts of the world that lack recent events to better understand and manage their own societal risks posed by tsunami threats. Conducting post-tsunami surveys and disseminating useful results to decision makers in an effective, efficient, and timely manner is difficult given the logistical issues and competing demands in a post-disaster environment. To facilitate better coordination of field-data collection and dissemination of results, a protocol for coordinating post-tsunami science surveys was developed by a multi-disciplinary group of representatives from state and federal agencies in the USA. This protocol is being incorporated into local, state, and federal post-tsunami response planning through the efforts of the Pacific Risk Management 'Ohana, the U.S. National Tsunami Hazard Mitigation Program, and the U.S. National Plan for Disaster Impact Assessments. Although the protocol was designed to support a coordinated US post-tsunami response, we believe it could help inform post-disaster science surveys conducted elsewhere and further the discussion on how hazard researchers can most effectively operate in disaster environments.

Link to article: http://link.springer.com/article/10.1007%2Fs11069-014-1418-7

RECENTLY PUBLISHED

Tsunami research

Changes in population evacuation potential for tsunami hazards in Seward, Alaska, since the 1964 Good Friday earthquake: By Nathan J. Wood; Mathew C. Schmidtlein; Jeff Peters, *Natural Hazards, Jan. 2014.*

Abstract: Pedestrian evacuation modeling for tsunami hazards typically focuses on current land-cover conditions and population distributions. To examine how post-disaster redevelopment may influence the evacuation potential of at-risk populations to future threats, we modeled pedestrian travel times to safety in Seward, Alaska, based on conditions before the 1964 Good Friday earthquake and tsunami disaster and on modern conditions. Anisotropic, path distance modeling is conducted to estimate travel times to safety during the 1964 event and in modern Seward, and results are merged with various population data, including the location and number of residents, employees, public venues, and dependent care facilities. Results suggest that modeled travel time estimates conform well to the fatality patterns of the 1964 event and that evacuation travel times have increased in modern Seward due to the relocation and expansion of port and harbor facilities after the disaster. The majority of individuals threatened by tsunamis today in Seward are employee, customer, and tourist populations, rather than residents in their homes. Modern evacuation travel times to safety for the majority of the region are less than wave arrival times for future tectonic tsunamis but greater than arrival times for landslide-related tsunamis. Evacuation travel times will likely be higher in the winter time, when the presence of snow may constrain evacuations to roads.

Link to article: http://link.springer.com/article/10.1007%2Fs11069-013-0859-8

Variations in population vulnerability to tectonic and landslide-related tsunami hazards in Alaska: By Nathan J. Wood; Jeff Peters, *Natural Hazards, Sept. 2014.*

Abstract: Effective tsunami risk reduction requires an understanding of how at-risk populations are specifically vulnerable to tsunami threats. Vulnerability assessments primarily have been based on single hazard zones, even though a coastal community may be threatened by multiple tsunami sources that vary locally in terms of inundation extents and wave arrival times. We use the Alaskan coastal communities of Cordova, Kodiak, Seward, Valdez, and Whittier (USA), as a case study to explore population vulnerability to multiple tsunami threats. We use anisotropic pedestrian evacuation models to assess variations in population exposure as a function of travel time out of hazard zones associated with tectonic and landslide-related tsunamis (based on scenarios similar to the 1964 M w 9.2 Good Friday earthquake and tsunami disaster). Results demonstrate that there are thousands of residents, employees, and business customers in tsunami hazard zones associated with tectonically generated waves, but that at-risk individuals will likely have sufficient time to evacuate to high ground before waves are estimated to arrive 30–60 min after generation. Tsunami hazard zones associated with submarine landslides initiated by a subduction zone earthquake are smaller and contain fewer people, but many at-risk individuals may not have enough time to evacuate as waves are estimated to arrive in 1–2 min and evacuations may need to occur during earthquake ground shaking. For all hazard zones, employees and customers at businesses far outnumber residents at their homes and evacuation travel times are highest on docks and along waterfronts. Results suggest that population vulnerability studies related to tsunami hazards should recognize non-residential populations and differences in wave arrival times if emergency managers are to develop realistic preparedness and outreach efforts.

Link to article: http://link.springer.com/article/10.1007%2Fs11069-014-1399-6

IN THE NEWS

International Tsunami News Headlines

House passes bill to authorize tsunami forecasting programs: By Cristina Marcos—The House on Monday passed a bill to authorize the National Oceanic and Atmospheric Administration's tsunami forecasting programs through 2017.

LINK: http://thehill.com/blogs/floor-action/house/216987-house-passes-bill-to-authorize-tsunami-forecasting-programs

FEMA honors achievement in community preparedness (Grays Harbor County): By Chuck Wallace—WASHINGTON – The Federal Emergency Management Agency (FEMA) today announced the winners of the 2014 FEMA Individual and Community Preparedness Awards, recognizing the outstanding efforts of individuals, programs and organizations throughout the country working to prepare their communities for emergencies.

LINK: http://nhma.info/fema-honors-achievement-in-community-preparedness-grays-harbor-county/

NEMA conducts Earthquake and Tsunami Awareness Campaign: By SKNIS—Basseterre, St. Kitts (SKNIS) – The National Emergency Management Agency (NEMA) continues to sensitize the public on natural disasters that can be devastating to St. Kitts and Nevis.

LINK: http://sknis.info/nema-conducts-earthquake-and-tsunami-awareness-campaign/

New tsunami evacuation app for Pacific states: By FEMA—Residents, emergency managers and tourists in Washington and Oregon have a new tool to help with tsunami preparedness. TsunamiEvac-NW is a new smartphone app that shows users:

- Evacuation zones where they live, work, or go to school;
- Helps people plan evacuation routes; and
- Maps important locations, buildings, and landmarks nearby.

LINK: http://tinyurl.com/l74yov2

New study reconstructs mega-earthquakes timeline in Indian Ocean: By Univ. of Miami Rosential School—MIAMI – A new study on the frequency of past giant earthquakes in the Indian Ocean region shows that Sri Lanka, and much of the Indian Ocean, is affected by large tsunamis at highly variable intervals, from a few hundred to more than one thousand years. The findings suggest that the accumulation of stress in the region could generate as large, or even larger tsunamis than the one that resulted from the 2004 magnitude-9.2 Sumatra earthquake.

LINK: http://tinyurl.com/o7m88g5

Japanese seismometer found in Haida Gwaii could shed new light on 2011 tsunami: By Yuliya Talmazan—A Japanese seismometer that was recovered on the B.C. coast this summer could help answer some important questions about what happened during the 2011 Japanese tsunami that claimed thousands of lives.

LINK: http://globalnews.ca/news/1521136/japanese-seismometer-found-in-haida-gwaii-could-shed-new-light-on-2011-tsunami/