

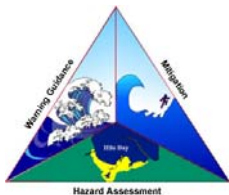
TsuInfo Alert



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Caribbean Tsunami Preparedness Takes Great Leadership

By Jennifer Lewis, NOAA National Weather Service

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Despite a long history of devastating tsunamis in the Caribbean region, there had been little coordinated effort to mitigate the threat prior to the establishment of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS) in 2005 as a subsidiary body of the IOC-UNESCO. Tsunami preparedness in the Caribbean has dramatically improved since then, due in great part to Ms. Christa von Hillebrandt-Andrade, first as Director of the Puerto Rico Seismic Network (PRSN), and as of 2010 in the role of Manager of the newly established

NWS's Caribbean Tsunami Warning Program (CTWP). In 2012, she became the Chair of the CARIBE EWS serving three terms by special request of the body. In April 2018, she passed the torch to the new Chair Dr. Silvia Chacon from Costa Rica.



Under Christa's persistent leadership, the Caribbean is now one of the better prepared regions in the world, with 100% of at-risk communities within the territories of Puerto Rico and the United States Virgin Islands (USVI) now recognized as TsunamiReady®, three International Tsunami Ready designations, and many other pilots underway. Since 2011, she has overseen the implementation of the IOC-UNESCO's CARIBE WAVE annual exercise to test all components of tsunami response in the Caribbean region. This exercise is the primary tool the IOC uses to determine the Tsunami Readiness in the Caribbean region. In support of the exercise, she helped facilitate the creation of the Caribbean page on www.TsunamiZone.org, which hosts an online participant registration system in the three most prominent Caribbean languages: English, Spanish and French. With this registration system in place, it has been possible to better track exercise participation. CARIBE WAVE has grown to become the largest international exercise. In 2018 there were over 640,000 participants representing 31 nations and 15 territories, slightly fewer than the record breaking 2017 exercise with 679,000 participants from 47 countries and territories. These exercises help virtually every at-risk entity in the region (e.g., schools, government agencies, universities, healthcare and tourism professionals) to develop reliable standard operating procedures and practices in order to quickly make life-saving decisions in the event of a major tsunami.

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NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:

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Caribbean Tsunami Preparedness Takes Great Leadership

By Jennifer Lewis, NOAA National Weather Service

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Christa has made an effort to engage each and every at-risk community in the Caribbean resulting in an expansion of TsunamiReady recognitions from one in 2006, to 49 by mid-2016 in Puerto Rico and the USVI, as well as five non-US communities designated as Tsunami Ready in the Caribbean and Central America. The International Tsunami Ready program grew from the NWS TsunamiReady program, and is designed to help build preparedness from the National Tsunami Warning Focal Points and National Tsunami Warning Centers down to the coastal communities at risk. Because of the expansion of the TsunamiReady program, the percentage of at-risk individuals that can be considered aware of and prepared for the Caribbean tsunami threat has increased from approximately 21% in 2010 to 76% in 2016. The USAID Office of Foreign Disaster Assistance (OFDA) has lent its support and resources to help communities to become Tsunami Ready and is supporting four more pilots in El Salvador, Saint Vincent and the Grenadines, Belize, and Jamaica. USAID-OFDA is also largely dependent on the procedures developed through CARIBE EWS for disaster risk reduction planning for tsunamis.

The tsunami preparedness measures now in place in the Caribbean region due to the leadership and tenacity of Ms. von Hillebrandt-Andrade have significantly reduced risk of life and property loss due to a tsunami for years to come. Her efforts have resulted in true “End-to-End” and community centered forecast, warning, and mitigation capabilities related to tsunami preparedness, and help to manifest the US National Weather Service vision of a Weather Ready Nation in the Caribbean region.



First LACSC and SSA Joint International Conference

By Carolina Hincapié and Christa von Hillebrandt-Andrade
NWS Caribbean Tsunami Warning Program

The Latin American and Caribbean Seismological Commission (LACSC) and the Seismological Society of America (SSA) held the joint international conference “Seismology of the Americas” in Miami, Florida on May 14–17, 2018. The conference was the first joint meeting between SSA and LACSC, which is one of four Regional Commissions of the International Association of Seismology and Physics of the Earth Interior (IASPEI). The meeting was an opportunity to build collaborations and work towards mitigation of earthquake hazards and increase resilience to natural disasters, including tsunamis.



LACSC and SSA members at the conference

Throughout the three days there were oral and poster presentations on tsunamis. Many partners from the National Tsunami Hazard Mitigation Program (NTHMP – including the National Weather Service’s Pacific Tsunami Warning Center, Caribbean Tsunami Warning Program, University of Puerto Rico at Mayagüez, United States Geological Survey, Texas A&M University at Galveston, California Geological Survey) presented their work at LACSC/SSA under different sessions of the conference.

The *Tsunami Modeling and Hazard Assessment* session included results from NTHMP workshops on benchmarking, numerical modeling of tsunami propagation, tsunami currents and tsunamigenic landslides. Additionally, studies on mitigation measures to increase capabilities for tsunami risk reduction for the Pacific, Caribbean and adjacent regions were presented.

The *Tsunami Outreach, Education and Warning Dissemination* session highlighted cross-disciplinary opportunities for increasing tsunami resilience. Researchers working across disciplines presented solutions to evacuation and warning. Others addressed how other more recent events such as hurricanes can be used to promote tsunami resilience and risk reduction.

The *Real-time GNSS Network Operations and Advances towards Early Warning Systems* session included contributions on the latest approaches in using Real-Time GNSS data for source inversion algorithms and producing seismic parameters in seconds to minutes after the occurrence of an earthquake. There were also presentations on advances in forecasting ground shaking and tsunami intensity (i.e. for early warning systems).

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First LACSC and SSA Joint International Conference

By Carolina Hincapié and Christa von Hillebrandt-Andrade

NWS Caribbean Tsunami Warning Program

(Continued from page 3)

The *Megathrust Earthquakes: Recurrence, Rupture Modes and Tsunamis* session provided five different topics for discussion: Patterns of earthquake recurrence; Differences among fault ruptures that overlap; Interseismic, coseismic and postseismic deformation; Splay faults as clues to megathrust rupture mechanics and tsunami hazards; and Subduction zones, as in the Caribbean, where the very occurrence of great tsunamigenic earthquakes has yet to be demonstrated.

Emergency Management, Resilience and Preparedness session focused on emergency planning, management, continuity of operations, technology, social processing and guidance. The timeline and response to the Honduras tsunami of January 2018 was discussed.

The session *Early Warning for Large Earthquakes and Tsunamis: Challenges, Case Studies and Innovations* invited scientists, engineers, practitioners and policy makers to present their research on Earthquake Early Warning (EEW) applications. It also included case studies such as: Innovative event recognition, source characterization and false alert avoidance algorithms; Characterization of uncertainties stemming from EEW algorithms and ground motion prediction in real-time; Comparison of point-source and finite-fault approaches; Performance assessment for long-duration and complex ruptures; Integration of real-time GPS data in EEW systems; Real-time ground motion and damage prediction; Exploration of local and global tsunami early warning; EEW case studies, testing and performance evaluation of existing systems; and discussion of implications for earthquake hazard, risk and response models with respect to the science community as well as private and government entities.

Mr. Alejandro de la Campa, director of the DHS/FEMA Region II Caribbean Area Division (Puerto Rico and the US Virgin Islands), was the keynote speaker for the Policy Luncheon. He highlighted the logistics and costs associated with responding to Hurricanes Irma and Maria. It was a reminder of the challenges, especially for isolated communities and islands to respond to catastrophic events, including earthquakes and tsunamis.

For a review of presentations, please check out the Seismology of the Americas site: <https://seismology2018.org/>

New Web Address for NWS Tsunami Safety Website

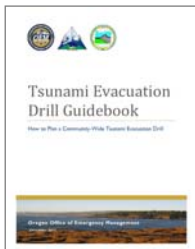
The web address for the National Weather Service's (NWS) Tsunami Safety Website has changed as the result of an NWS-wide transition to a new content management system. The new address is officially <https://www.weather.gov/tsunamisafety>. Users are encouraged to update bookmarks and links on their agency websites, and elsewhere, if they are using a different address. The NWS Tsunami Safety website can also be accessed through the Safety menu on the NWS homepage: <https://www.weather.gov/>.



2018 Oregon Coast March Road Show

By Althea Rizzo, Oregon Office of Emergency Management

The Oregon Office of Emergency Management (OEM) was on the road in March speaking to coastal communities about tsunami preparedness. Althea Rizzo, Geological Hazards Program Coordinator, visited every county to meet with local community leaders to discuss updates to the Tsunami program. OEM recently released a Tsunami Evacuation Drill Guidebook and this road show provided an opportunity to share this resource with local coastal groups. Evidence from the Japanese event shows that communities which hold regular tsunami evacuation drills have a much higher rate of survival. Other topics covered with community leaders included an assessment of the January tsunami Watch from Alaska, leveraging existing efforts such as Master Gardeners, and an upcoming revision of the Coastal Community Tsunami Response Guidebook.



Rizzo also participated in a movie night at the Seaside Library where, Oregon Public Broadcasting's, "Unprepared" was shown, followed by a panel discussion. In all, Rizzo visited seventeen communities with more than 300 people attending the various events.

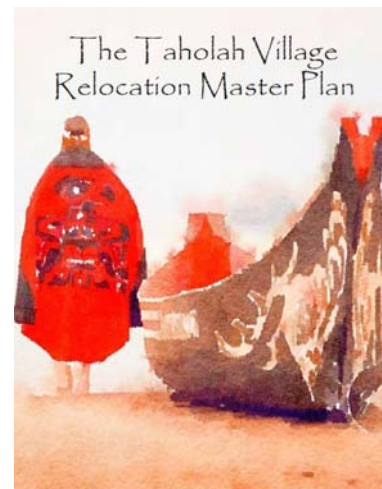
Access Guidebook: http://www.oregongeology.org/tsuclearinghouse/resources/pdfs/OEM_Tsunami_Evacuation_Drill_Guidebook_FINAL_12-19-2017.pdf

2018 Governor's Smart Communities Award Winners Announced

By John Schelling, Washington State Department of Commerce

Washington State Governor Jay Inslee announced winners of the 2018 Smart Communities Awards on May 24, 2018, which included the Quinault Indian Nation's Taholah Village Relocation Master Plan effort. Now in its 13th year, the program recognizes achievements by local leaders who promote smart growth planning and projects that contribute to thriving communities, a prosperous economy, and sustainable infrastructure in Washington State.

The master plan is unique, and clearly carries out the goals of Washington's Growth Management Act as well as effective hazard management planning practices. The incorporation of chapters addressing resilience to tsunami disasters and sustainability planning is in line with the Governor's Resilient Washington State Subcabinet goals, and demonstrates quality design and sustainability principles. The Washington Geological Survey provided a tsunami inundation model to validate the Quinault Indian Nation's relocation strategy. Funding was provided by NOAA's National Tsunami Hazard Mitigation Program.



Mw7.9 Gulf of Alaska Earthquake on January 23, 2018

By Rick Wilson, California Geological Survey

A new report by the Earthquake Engineering Research Institute evaluates the tsunami science, notification, and response efforts for the magnitude 7.9 Gulf of Alaska earthquake at 12:31 AM Alaska Standard Time on January 23, 2018: https://www.eeri.org/wp-content/uploads/EERI-Recon-Rpt-012318-Alaska-EQ-and-tsunami_fn.pdf. The earthquake was centered approximately 250 kilometers southeast of Kodiak Island, along a northeast trending strike-slip fault about 100 kilometers south of the Alaska-Aleutians trench (Figure 1). A small tsunami less than one-foot high was generated and measured in Alaska, British Columbia, and the west coast of the continental U.S.

For the first several hours following the earthquake, the south coast of Alaska and west coast of British Columbia were placed in a Warning-level alert status and the west coast of the U.S. was placed in a Watch-level alert. Residents along the Alaska and British Columbia coastlines evacuated to high ground or inland based on the tsunami Warning, and notifications went out to coastal communities along the west coast of the U.S. about the Watch.

The report notes a number of issues and lessons learned, including:

- Complications in source modeling and other factors caused delays in resolving the forecasts for the Watch area leading to some issues for U.S. west coast state and local emergency managers.
- High traffic caused federal and local websites and phone systems to become overloaded, limiting access to information.
- Many emergency managers recommended further streamlining of information bulletins and improving the availability of more timely and consistent information coming from the federal tsunami warning centers and the states.

The states and the tsunami warning centers are working together to evaluate these and other findings in the report in order to make improvements for future events.

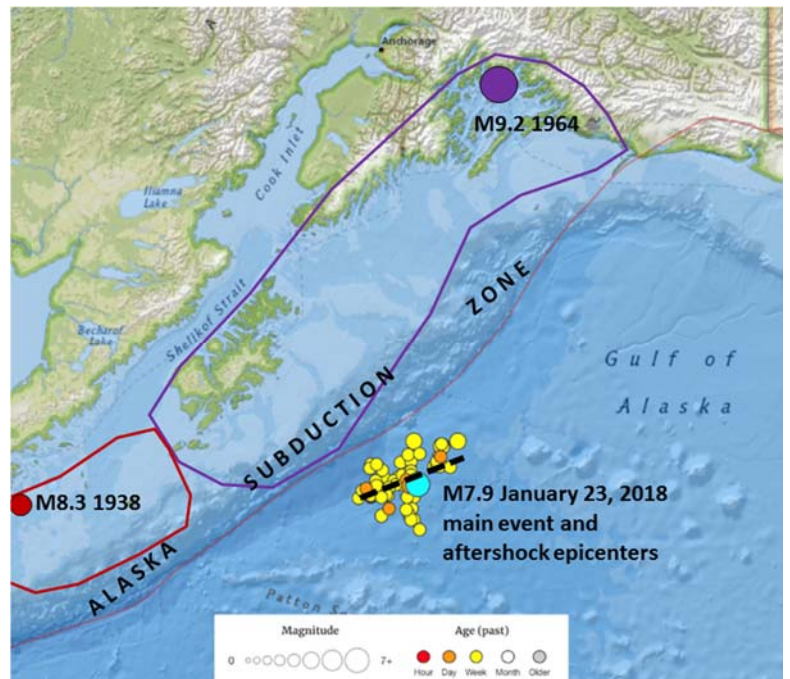


Figure 1. Surface projection of the main earthquake and aftershocks, which outlines the general trend of fault rupture. Proximity to previous earthquakes and the Alaska Subduction Zone are shown. Figure modified from USGS event website.

NTHMP NEWS

TsunamiReady® Recognition Milestones

By Rocky Lopes, NTHMP Administrator

As of May 31, 2018, there are 200 sites recognized as TsunamiReady. During the period from October 1, 2017, to May 31, 2018, the following sites received their first TsunamiReady recognition:



- Maili, Hawaii
- Nanakuli, Hawaii
- Makaha, Hawaii
- Waianae, Hawaii

These four communities on the Western coastline of Oahu took a number of steps toward better disaster preparedness through active participation with the grassroots Wai'anae Coast Disaster Readiness Team. (See <http://waianaeready.com/> for more information.)

The following communities renewed their TsunamiReady recognition between October 1, 2017, and May 31, 2018:

- Anderson Air Force Base, Guam
- Bandon, Oregon
- Big Lagoon Community and Rancheria, California
- Brunswick County, North Carolina
- Cabo Rojo, Puerto Rico
- Clallam County, Washington
- Coos County, Oregon
- Crescent City, California
- Dorado, Puerto Rico
- Douglas County, Oregon
- Georgetown County, South Carolina
- Hawaii County, Hawaii
- Homer, Alaska
- Imperial Beach, California
- Isabela, Puerto Rico
- Jefferson County, Washington
- Liberty County, Georgia
- Mahah Tribe, Washington
- Naval Base, Guam
- Norfolk, Virginia
- Oceanside, California
- Pacific County, Washington
- Rota, CNMI
- Seal Beach, California
- St. Croix, USVI
- St. John, USVI
- St. Thomas, USVI
- Tinian, CNMI
- Unalaska, Alaska
- Whittier, Alaska (previous FY/not reported before)
- Yurok/Klamath, California

There were no additional TsunamiReady Supporter sites recognized during this period.

Also during this period, two previously recognized TsunamiReady sites were not renewed. Based on the evaluation of the NWS Forecast Office of jurisdiction, the communities could not meet the TsunamiReady Guidelines.

Note: considering the impact of hurricanes on Puerto Rico, this territory has been granted a one-year expiration waiver for renewal of TsunamiReady communities for any sites that may expire between September, 2017, and August, 2018. There are nine sites in Puerto Rico in this category which require renewal for Puerto Rico to keep its "all island TsunamiReady recognition".

TSUNAMI MAPS & NTHMP EVENTS

Tsunami Hazard Maps of Southwest Washington—Model Results from a ~2,500-year Cascadia Subduction Zone Earthquake Scenario

By Daniel W. Eungard, Corina Forson, Timothy J. Walsh, Edison Gica, and Diego Arcas

ABSTRACT: New finite-difference modeling along the southern Washington coast in the area surrounding Willapa Bay and Grays Harbor uses a simulated magnitude 9 earthquake event with a maximum slip of 88.6 feet (27 meters), inferred to be a ~2,500-year event, or the L1 scenario. This new modeling closely approximates the design requirements in the building code standard for critical facilities, and is more conservative (greater inundation) than previous tsunami modeling. Modeling results indicate that the first tsunami wave will arrive on land along the outer coast 15 to 20 minutes following the earthquake. Inundation depths range from 20 to 60 feet (6–18.2 meters) on the outer coast, decreasing to generally less than 10 feet (3 meters) within Willapa Bay and Grays Harbor. Current velocities from the tsunami waves locally exceed 35 knots, presenting a significant navigational hazard to the maritime community. Tsunami wave inundation is expected to continue over 12 hours and remain hazardous to maritime operations for more than 24 hours after the earthquake. This study is limited in that modeling does not account for tidal effects, liquefaction, or minor topographic changes that would locally modify the impact of tsunami waves. Due to these limitations, this modeling should not be used for site-specific tsunami inundation assessment or for determining effects on the built environment. However, this model is an excellent tool for evacuation and recovery planning.



CITATION: Eungard, D. W.; Forson, Corina; Walsh, T. J.; Gica, Edison; Arcas, Diego, 2018, Tsunami hazard maps of southwest Washington—Model results from a ~2,500-year Cascadia subduction zone earthquake scenario: Washington Geological Survey Map Series 2018-01, originally published March 2018, 6 sheets, scale 1:48,000, 11 p. text.

<https://deptofnaturalresources.box.com/s/lldsiyyhn0jtkkybgk4uyglzptg4z9m8f>

UPCOMING NTHMP & RELATED EVENTS

- ◆ June 25-29, 2018—11th National Conference on Earthquake Engineering (NCEE) (Los Angeles, California) <https://11ncee.org/>
- ◆ July 24-26, 2018—July 24-26, 2018—NTHMP Mitigation and Education Subcommittee and Mapping and Modeling Subcommittee Summer Meetings (Sacramento, California) <https://nws.weather.gov/nthmp/2018mesmms/index.html>
- ◆ July 24-27, 2018—A Natural Hazards Engineering Research Infrastructure (NHRI) RAPID Facility Intensive Workshop (Seattle, Washington) <https://tinyurl.com/RapidIntensiveWorkshop2018>
- ◆ September 15-23, 2018—Association of Environmental & Engineering Geologists (AEG) 61st Annual Meeting & XIII IAEG Congress (San Francisco, California) <https://www.aegannualmeeting.org/>
- ◆ December 10-14, 2018—American Geophysical Union Fall Meeting (Washington, D. C.) <https://fallmeeting.agu.org/2017/future-meetings/>

