



Creating Tsunami Champions: ITP-25

By Alayne Benson (UCAR COMET Program), Laura Kong (NOAA-NWS International Tsunami Information Center) and Christa von Hillebrandt-Andrade (NOAA-NWS International Tsunami Information Center, Caribbean Office)

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In September 2025, The International Tsunami Information Center (ITIC) held a 10-day Tsunami Early Warning Systems training program (ITP-TEWS-25) in Honolulu, Hawaii. This training, held less than two months after the 29 July 2025 Kamchatka tsunami event, challenged 31 tsunami warning and emergency response officials from 22 countries to become their country's tsunami champions on their return. *The ITP brings together warning and response officials from tsunami prone countries around the world to network, share best practices, and learn together. Through classroom and hands-on learning activities aimed at enriching their understanding of the tsunami warning chain, each takes home tools and a wealth of knowledge that will strengthen their tsunami warning and preparedness.*

The importance of this training program to minimizing life and property losses cannot be overstated. The quick onset and immediate impact of tsunamis make these events especially deadly for under-prepared regions. In order to warn quickly and have the at-risk public evacuate, agencies must pre-plan and have protocols and procedures which are well-known, well-exercised and practiced. Recognizing that coastal communities play a vital role in protecting the U.S. and other nations from tsunamis, the [NWS TsunamiReady® Program](#) and the UNESCO Intergovernmental Oceanographic Commission's (IOC) [Tsunami Ready Recognition Program](#) also work to prepare tsunami-risk communities through efforts such as ITP-TEWS-25. And tsunami preparedness is exactly what ITP-TEWS-25 delivered.



ITP-25 participants and instructors gathered in Honolulu, Hawaii, with Mr. A. J. Reiss, Director of the Ocean and Prediction Center, NCEP, at NOAA Pier 38 for ten days of tsunami preparedness training.

Ten Days of Building Tsunami Resiliency

From September 15 to 26, 2025, 18 instructors from International Tsunami Information Center (ITIC), Pacific Tsunami Warning Center (PTWC), NOAA Pacific Marine Environmental

TsuInfo Alert

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NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:

<http://d92019.eos-intl.net/D92019/OPAC/Index.aspx>

The views expressed herein are those of the authors and not necessarily those of NOAA, the Washington Department of Natural Resources, or other sponsors of TsuInfo Alert.

Gordon Bell Prize Awarded for Cascadia Tsunami Digital Twin

By Stefan Henneking (UT Austin) & Alice-Agnes Gabriel (Scripps, UCSD & LMU Munich)

In November 2025, a team from The University of Texas at Austin, Lawrence Livermore National Laboratory, and Scripps Institution of Oceanography received the "Nobel Prize" of Supercomputing, the ACM Gordon Bell Prize for their paper "Real-time Bayesian inference at extreme scale: A digital twin for tsunami early warning applied to the Cascadia subduction zone" ([Henneking et al., SC25](#)). Their study uses leadership-class CPU and GPU supercomputers to address a key challenge that is central to the National Tsunami Hazard Mitigation Program (NTHMP): how to generate reliable, physics-based tsunami forecasts fast enough to inform protective action along vulnerable coastlines.

The team says that this new capability could radically improve emergency response and save lives, forming the backbone of next-generation early warning systems. During a future event, their newly developed digital twin of the Cascadia subduction zone could continuously assimilate real-time observations (for example from deep-ocean pressure sensors) and use Bayesian inference to identify which [spatiotemporal seafloor motions](#) are consistent with the incoming data. The inferred seafloor motion is then used to generate probabilistic tsunami forecasts, including wave heights, arrival times, and associated uncertainties, delivered within seconds of receiving new measurements. Because this framework is built on fully physics-based models rather than simpler scaling relations, it captures effects such as complex earthquake rupture geometries, frequency-dependent wave propagation, and the influence of offshore bathymetry.



Link to Scripps news article:

<https://scripps.ucsd.edu/news/2025-acm-gordon-bell-prize-awarded-breakthrough-research-real-time-tsunami-forecasting>

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Laboratory (PMEL), University of Hawaii (UH), Hawaii Emergency Management Agency (HI-EMA), and Honolulu Department of Emergency Management (DEM) led participants in learning how to build and operate a robust and reliable tsunami warning system. Activities included tsunami warning and response simulations, mock evacuation drills, lessons learned, presentations, discussions, and more.

Using Hawaii as a working example of an end-to-end tsunami warning and mitigation system, the training followed the tsunami warning chain, focusing on tsunami warning activities in week one and tsunami emergency response in week two. Participants also visited the PTWC, and State and County Emergency Operation Centers (EOCs), while the University of Hawaii Sea Level Center showcased instrumentation used to monitor sea level and tsunamis.

Ms. Doreen Ikula of Seychelles shared that upon her return “I was very happy to present on tsunamis and demonstrate Tide Tool and TSUCAT from the ITP 25. With stakeholders I was also able to have a fruitful discussion and build Tsunami Ready awareness.”

Tsunami Warning Lessons Learned

Week one and the first half of week two included a whirlwind of presentations from each participant on their country’s tsunami warning and mitigation system; presentations and discussions with PTWC and Hawaii technical and emergency agencies (HI-EMA, DEM, UH); and Standard Operating Procedures (SOPs) training for enabling consistent and rapid tsunami warning response.

The training capitalized on the risk-mitigation success of the recent 29 July 2025 Kamchatka Tsunami Warning in Hawaii during a discussion led by ITIC, with PTWC, Hawaii State Emergency Management Agency (HI-EMA), and Honolulu Department of Emergency Management (DEM). The rapid and coordinated US and international response to the Kamchatka event was unparalleled in modern history, providing a vital example of ongoing efforts to protect lives and resources before, during, and after natural disasters.

“Destructive tsunami waves along any coast are rare. Without champions to help countries become and stay prepared, and then respond rapidly and appropriately when tsunamis occur, then tsunami threat guidance issued by centers like PTWC will not be effective,” said Dr. Charles McCreery, PTWC Director.

“Getting feedback from countries is important for making our forecasts more effective,” added Dr. Dailin Wang, who is PTWC’s principal tsunami forecaster.

Surviving the Wave

Then came the big wave. On day seven, participants role-played as tsunami survivors as part of the Ala Moana Wave 25

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Participants visited the NOAA Inouye Regional Center (IRC) where the PTWC demonstrated their operations, and ITIC shared software tools for assessing tsunami threat. NWS Pacific Region Deputy Director, Tom Evans, used the IRC’s Science on Sphere to animate a tsunami wave propagating across the Pacific.

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tsunami evacuation drill from a mock local tsunami generated by an M8.1 earthquake off Kona, Hawaii. Every coastal community member should quickly and immediately evacuate on foot when there is a local tsunami, and this exercise enabled participants to test the viability of their evacuation to save their lives.

After donning their Tsunami Ready® baseball caps (provided by the Indian Ocean Tsunami Information Centre) and starting their position trackers on their mobile phones to help track their movements, four groups evacuated from Ala Moana Beach. Afterwards participants analyzed their movements, which were superimposed on an inundation wave animation of the mock tsunami, to determine if they escaped the wave.

“The wave hit in about 25 minutes and it took us 20 minutes to reach safety. If they hadn’t started to evacuate immediately after receiving the warning and siren alerts, they could have drowned. AMWave25 demonstrated the importance of not waiting.” recounted Dr. Laura Kong, ITIC Director.

Christa von Hillebrandt-Andrade, Manager of the ITIC Caribbean Office, was blindfolded during the evacuation event, using her spouse as a guide. This was in response to her office’s effort to develop material for the blind and visually impaired. She noted that “without having a personal guide it would have been impossible to reach the evacuation zone safely and quickly” highlighting the importance of special planning by and for this community.



Participants analyzed PTWC forecast products during EHW-25 and crafted responses to decision-makers, schools, and the public to prepare affected communities and minimize losses.

Putting it All Together

The training concluded with a two-day test of the participant’s tsunami-resiliency called Exercise Hawaii Wave 2025 (EHW-25), led by PTWC and ITIC. Participants role-played as the countries of Tonga, New Zealand, and Chile to respond to a M8.8 earthquake and tsunami from the northern Tonga Trench. The countries analyzed the PTWC tsunami forecast products, and issued warnings and emergency actions by following their pre-planned SOPs. Instructors from the PTWC, ITIC, and IOTIC role-played as presidents and high-level officials, the media, harbor officials, schools, and the general public, crowding communications channels and urgently asking for impact status and what to do through voice and video.

Mr. Petelo Taulaki (Forecaster, Tonga Tsunami Warning Center) commented that “for the October 7 Papua New Guinea earthquake I was able to issue tsunami messages to Tonga quicker and monitor in real time the sea level thanks to the ITP-25 training, decision support tools and the EHW-25 exercise”.

The ITIC Training Programme on Tsunami Early Warning Systems is a joint collaboration with the UNESCO-IOC and was made possible through funds from an Interagency Agreement between NWS International Affairs and U.S. Department of State Office of International Disaster Response, and the support of the National Oceanic and Atmospheric Administration, the Hydrographic and Oceanographic Service of the Chilean Navy, and the Pacific Community (SPC).

NTHMP PARTNER UPDATES

Camuy Health Services Inc., a New TsunamiReady Supporter in Puerto Rico

By Wildaomaris González Ruiz, Puerto Rico Emergency Management Bureau (PREMB)

The Camuy Health Services Inc. is an important two-level clinic in Camuy, Puerto Rico, located a third of a mile from the sea (Figure 1). The clinic receives around 55,000 visits a year, from 17,825 patients, which are served by roughly 220 employees working three shifts over the course of a day. The facilities operate 24 hours a day, which includes an emergency room. It should be noted that if a tsunami warning were issued, some of the areas that could be impacted are the oxygen cylinder storage, the electrical substation, the generator, the cistern (17,000 gallons), the materials warehouse, the Physical Plant equipment warehouse, the biomedical storage area, the sprinkler system pump, the chiller mechanical room, the Emergency Room, and the Outpatient Clinics. If a tsunami warning is issued, they will evacuate the patients with mobility limitations to the assembly point A3 (Municipal Public Parking). This assembly point is about a quarter mile from the clinic. It's noteworthy



Figure 1: Location of Camuy Health Services inside the Tsunami Evacuation Zone (<https://maptool.uprm.edu/>).

that, so far this year, over 2,500 earthquakes have occurred in Puerto Rico, of which hundreds were magnitude 3.5 or greater, making the preparedness for health centers vital to safeguarding the lives of their patients and visitors.

This health center is very committed to providing the best service to its patients, which is why they have a very well-structured incident command system and a very well-structured tsunami emergency plan that has been proved during the Caribe Wave exercises and the Great ShakeOut. Employees have been trained on what to do before, during, and after an earthquake and tsunami, as well as on the tasks to follow during a tsunami watch, warning, or advisory for Puerto Rico.

The TsunamiReady recognition event was attended by key figures in Camuy Health Services, including the Executive



Figure 2: TsunamiReady Supporter Recognition for the Camuy Health Services Inc. From left to right: Security Manager Zulmarie Curbelo, Ernesto Morales (NWS), Wildaomaris González (PREMB), Dra. Iris Oquendo Negrón and Executive Director, Licenciado Eddie Pérez Cabán.

Director, Licenciado Eddie Pérez Cabán, Dra. Iris Oquendo Negrón, the Security Manager Zulmarie Curbelo, in addition to personnel from the Puerto Rico Tsunami Program: Ernesto Morales (NWS), and Wildaomaris González Ruiz (PREMB) (Figure 2).

NTHMP PARTNER UPDATES

Updates from American Samoa

By Aukusitino Steffany, Program Liaison, American Samoa Department of Homeland Security

During October, tsunami outreach activities and drills were conducted at Uifa'atali Peter Coleman Elementary School and Tuato'o Elementary School. For Uifa'atali Peter Coleman Elementary in Pago Pago, the event provided an important opportunity to reinforce tsunami preparedness, especially since Pago Pago was heavily affected by the September 2009 tsunami. At Tuato'o Elementary School in Alofau, where many students come from communities on the east side of Tutuila, the outreach event offered a valuable chance to broaden tsunami awareness across the communities. Additionally, this time provided an opportune moment to address the recent 8.8 magnitude earthquake in Kamchatka, Russia which triggered a Tsunami Advisory for American Samoa. This also provided us the opportunity to expand on the importance of alert levels and the need for all school personnel to enhance their understanding of the procedures and communications issued during such events. The tsunami evacuation drills offered practical experience, allowing students/faculty members from both schools to familiarize themselves with evacuation procedures and safety and to also point out where improvements can be made. The American Samoa Tsunami Team also provided constructive feedback to help improve and strengthen the school's overall tsunami preparedness.



Group photo taken with Coleman Elementary School at their safe location

For the month of November, the American Samoa Tsunami Team conducted numerous outreach activities. Early in November, the American Samoa Tsunami Team was asked to conduct a tsunami preparedness event for all staff members of Samoana High School. The school, which is located in the village of Utulei, serves primarily students from the east side of Tutuila, as it is one of only two high schools at the east side of Tutuila. Additional outreach activities were also done for staff members of the American Samoa Department of Health (DOH) Clinics. For Tutuila, there are a total of three clinics on the island. The tsunami outreach activities for both Samoana High School and DOH aimed to prepare employees with the knowledge and skills needed for an effective response during a tsunami event and to also ensure that evacuation plans are up to date and clearly understood. The American Samoa Tsunami Team was also invited to assess Alataua II Elementary School tsunami evacuation drill. This was a great opportunity to go over the school evacuation plans and to also provided feedback to help improve their plans.



Tsunami outreach for all staff and divisions of DOH Clinics

The American Samoa Tsunami Team was invited to attend the Ocean Science to Service workshop that took place on November 17 to the 21, 2025. This event was hosted by the NWS in collaboration with the South Pacific Community (SPC). The workshop brought together a diverse group of stakeholders, including state and federal agencies, the private

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Updates from American Samoa

By Aukusitino Steffany, Program Liaison, American Samoa Department of Homeland Security

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sectors and community organizations. The purpose of this workshop was to strengthen ocean science knowledge and improve access to ocean data, tools and services in American Samoa, and to also ensure that ocean related data and information are effectively used to support territorial priorities. Members of the American Samoa Tsunami Team, Aukusitino Steffany and Jolene Kava, were guest speakers on behalf of ASDHS. They shared their expertise in disaster preparedness and response and also provided insight on the role ASDHS plays during a disaster and also the assistance that's provided.



Ocean to Science Workshop group photo

CRESCENT Announcements and Upcoming Webinars

Webinars

- 12/18/2025, 1:00-2:00 pm - Erick Velasco-Reyes, Oregon State University:
"From Tsunami-Induced Scour to Critical Infrastructure Failure: Insights from Hydrodynamic and Cascading Consequences Modeling for Newport"
https://oregonstate.zoom.us/webinar/register/WN_AI0fRukbSeyPaN9Fkb0mAA#/registration
- 1/29/2026, 1:00-2:00 pm - Joe Louis, Oregon State University:
"Visualization, Analysis, and Decision Support for Post-Disaster Roadway Recovery"
https://oregonstate.zoom.us/webinar/register/WN_VDXC8QluTLKX0xmTBVxHoA#/registration

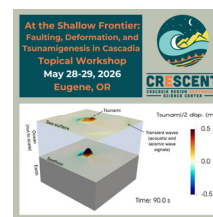
Application Open for 2026 CRESCENT Topical Workshop

CRESCENT's Dynamic Rupture, Earthquake Cycle, and Tsunamis Working Group (DET) is organizing a Topical Workshop on May 28 & 29, 2026, at the University of Oregon in Eugene, OR. "[At the Shallow Frontier: Faulting, Deformation, and Tsunamigenesis in Cascadia](#)" is a workshop to determine future research priorities to capture the full complexity of shallow rupture, deformation processes, and tsunami generation to improve tsunami hazard assessments for Cascadia. Apply to attend by 15 January, 2026.

Workshop and application info here: <https://cascadiaquakes.org/2025/01/20/det-topical-workshop/>

CLiP WEBINAR
From Tsunami-Induced Scour to Critical Infrastructure Failure: Insights from Hydrodynamic and Cascading Consequences Modeling for Newport
12/18/2025
1:00-2:00 pm (PST)
Dr. Erick Velasco-Reyes
Postdoctoral Scholar
College of Engineering, OSU
REGISTER NOW

CLiP WEBINAR
Visualization, Analysis, and Decision Support for Post-Disaster Roadway Recovery
1/29/2026
1:00-2:00 pm (PST)
Dr. Joseph Louis
Associate Professor of Civil and Construction Engineering, OSU
REGISTER NOW



NCEI NATURAL HAZARDS IMAGE DATABASE

EVENT: November 29, 1975 Hawai'i Earthquake and Tsunami—On November 29, 1975, a magnitude 7.7 (Mw) earthquake struck the southern coast of the Island of Hawai'i. The earthquake was followed by a tsunami, submarine landslide, and small volcanic eruption. The ensuing tsunami waves were locally damaging, resulting in 2 deaths, various injuries, and approximately \$1.5 million dollars (1975) in tsunami damages. The largest recorded tsunami runup was 47 ft (14.3 m) at Keauhou Landing, Hawai'i Island. The tsunami was recorded at tide gauges throughout the Pacific including Alaska, California, Canada, Chile, Galapagos Islands, Japan, Mexico, Peru, and Samoan islands. View the event runup observations, calculated travel-times and modeled deep-ocean amplitudes on the [NCEI map viewer](#).



PHOTO DETAILS: Halapē, Hawai'i Morning after the magnitude 7.7 earthquake at Halapē, Hawai'i Volcanoes National Park. The land permanently dropped approximately 10 ft (~3.0 m) generating a tsunami that inundated coconut trees. Image courtesy of D. Reeser, National Park Service. <https://www.ngdc.noaa.gov/hazardimages/#!/tsunami/290>

More images from this event are available in the [NCEI Natural Hazards Image Database](#). Any parties interested in contributing photographs to this free and public resource may contact NCEI for submission requirements at haz.info@noaa.gov or Lindsey Wright at lindsey.m.wright@noaa.gov.

Link to NCEI Natural Hazards Image Database: <https://www.ngdc.noaa.gov/hazardimages/#!/>

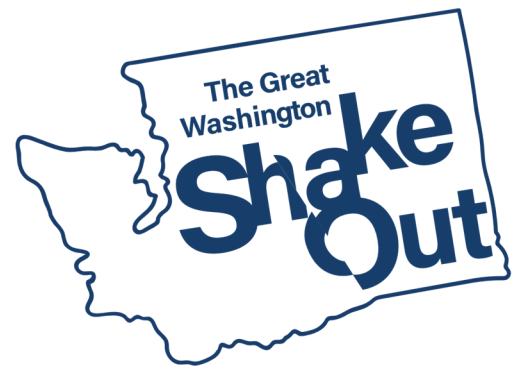
NTHMP PARTNER UPDATES

Shaking Up Social Media: Lessons Learned from Washington State's Great ShakeOut Social Media Efforts

By Elyssa Tappero and Danté DiSabatino
Washington State Emergency Management Division

The Great Washington ShakeOut is Washington State's largest earthquake and tsunami public outreach campaign. This annual outreach campaign is facilitated by the Washington Emergency Management Division's (WA EMD) Hazards and Outreach Section and includes targeted outreach across various forms of traditional and social media to educate the public about earthquake and tsunami hazards. For ShakeOut 2025, the Hazards and Outreach Section experimented with producing a series of short videos to post on social media platforms like Facebook, X (formerly Twitter), Instagram, NextDoor, BlueSky, and Threads.

While the real measure of whether these yearly efforts are successful will come with the next earthquake and tsunami, some core lessons learned through the campaign may be helpful for others engaging in similar work.



Monitor Engagement by Platform

No agency has the capacity to be on every social media platform, so it's important to identify which platforms your audience frequents most. Userbases on these platforms also fluctuate over time as popularity rises and falls. Social media metrics are a useful tool for tracking public engagement to see where your audience is most active. For example, Facebook remains one of WA EMD's best-performing social media platforms with a following of more than 150,000 people, and during the ShakeOut campaign our content generated over 2.6 million video views.

Bluesky and Instagram are both platforms on which WA EMD is building a larger presence. While BlueSky currently has a smaller userbase, our audience is more science-focused and represents an opportunity to craft more detailed messaging. On the other hand, WA EMD used to push much more content to X, but engagement there has dropped considerably as government agencies and other organizations have moved to other platforms. NextDoor traffic also decreased by more than half over the last year, though the reason is less clear. While WA EMD will continue providing vital alert information on these platforms during real-world tsunami events, posting on "blue sky" days will probably be reduced.

Identify Popular Topics

Another benefit of social media metrics is the ability to identify topics popular with your audience. For example, posts about tsunami sirens, especially related to when they're tested, do very well on Facebook. A [short, humorous video](#) by WA EMD reminding viewers about the ShakeOut tsunami siren test had almost 344,000 views on Facebook, representing real audience exposure. This content does not always need to take the form of an in-depth video. A simple reminder graphic posted on the day of ShakeOut was shared over 800 times.

Tracking social media analytics over time allows you to identify topics your audience wants to hear about. Our team has started examining click-through rates, retention, and engagement to strategically guide and inform future content

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NTHMP PARTNER UPDATES

Shaking Up Social Media: Lessons Learned from Washington State's Great ShakeOut Social Media Efforts

By Elyssa Tappero and Danté DiSabatino
Washington State Emergency Management Division

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development. Providing this information in a variety of forms – video, static graphics/photos, plain text, etc. – ensures the greatest accessibility and interest for the greatest number of people.

Capitalize on Social Media Trends

Trends – like popular memes, TikTok dance crazes, and viral audio clips – drive content on most social media platforms. Posting something that utilizes a current trend or that is otherwise familiar to your intended audience increases the chances of people seeing and sharing your content. For example, a [WA EMD parody video](#) inspired by the hit mockumentary-style TV show *The Office* achieved an almost 6% click-through rate – one of the highest in the entire ShakeOut media campaign and compared to previous engagement. This means 6% of people who saw the video clicked the associated link. A high click-through rate like this shows your content successfully motivated people to take the next step – in this case, to seek out additional resources about natural hazards. Another example was when we used a trending song and a dance at the end of the video to encourage people to stop putting off their ShakeOut registration, as shown [here](#) with over 83,000 views. [Our Trust Fall video](#) – based on a trend started by the New Berlin Library – took no more than 15 minutes total to film, edit, and post and garnered over 10,000 views. Last year, we hopped on a trend about finding love in unlikely places, posting [a video of us](#) drop-cover-and-holding on under a desk during an earthquake – one that racked up over 184,000 views.

Harnessing the power of social media trends also allows you to catch your audience's attention quickly. On social media, every second counts. Across WA EMD's ShakeOut campaign, the average view time for Facebook videos was between 7 and 12 seconds. That means not only that a viewer's attention must be hooked in just a couple seconds to keep them watching, but that key messaging should be delivered within the first 10 seconds to ensure most viewers receive it. When you package that hook and message in something trendy, you're more likely to keep the viewer around long enough to complete your objective.

Take Risks and Have Fun

A beneficial aspect of social media is that any engagement boosts your message. This means you can take some risks with how you present information, knowing that even if it isn't received well by your entire audience, it will still draw attention. For example, a video [parodying popular ASMR videos](#) generated strong reactions, both positive and negative, from more than 250 viewers. Regardless of whether they liked the video or not, however, their interactions with it boosted its visibility until it had been watched more than 25,000 times. Over 1,500 people clicked the associated link to learn more about earthquake protective actions. [Another video](#), which capitalized on an infamous Coldplay concert clip from earlier in the year, also garnered polarized opinions – and was viewed more than 60,000 times.

Not every post will be a smash hit. Not every video will go viral. What's important is that you have fun making them (people can tell when you don't!), get creative, and try new things. Over time you'll find what works best for your agency and your audience.

NTHMP PARTNER UPDATES

A Tsunami Maritime Response and Mitigation Strategy for the Port Angeles Harbor and John Wayne Marina is Published!

By Ethan Weller, Washington State Emergency Management Division

On December 4th, 2025, Washington Emergency Management Division published the sixth Tsunami Maritime Response and Mitigation Strategy in Washington, covering the Port Angeles Harbor and John Wayne Marina in nearby Sequim Bay. The Port of Port Angeles has long been a critical community hub in Clallam County, along the Strait of Juan de Fuca. With numerous terminal facilities along the waterfront that support other critical maritime partners such as the Black Ball Ferry Line and Arrow Launch Services, the need for proactive response and mitigation planning for the Port of Port Angeles is critical to reducing future tsunami impacts and improving the resiliency of the maritime sector in Clallam County. This strategy represents the culmination of knowledge provided by more than 20 agencies and organizations.

Two different tsunami scenarios were mapped and modeled by the Washington Geological Survey as part of this work to improve our understanding of tsunami risk: a local M9.0 Cascadia subduction zone (CSZ) earthquake-generated tsunami and a distant M9.2 Alaska Aleutian subduction zone (AASZ) earthquake-generated tsunami, similar to the 1964 earthquake but with a modified epicenter to direct more energy towards Washington state, allowing for more conservative results. Results showed little inundation

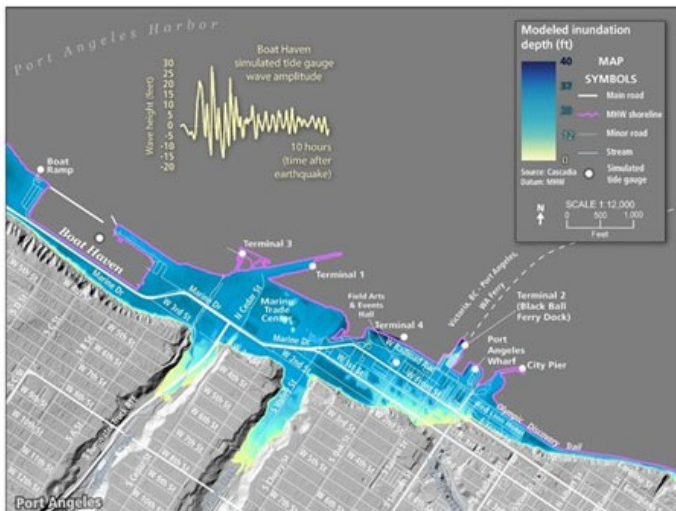


Figure 2. Modeled maximum tsunami inundation depths over land on the tip of the Ediz Hook in the CSZ scenario. Inundation depths are expected to reach more than a dozen feet along Port Angeles Harbor. Yellow and green colors are associated with 0 – about 10 feet of inundation, while aqua-blue-dark blue colors approximately represent 10 – 25 – 40 feet or more of inundation, respectively.

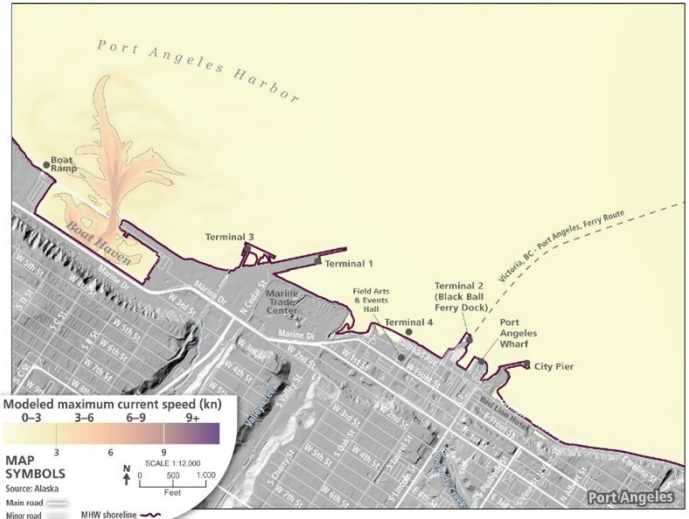


Figure 1. Modeled tsunami current speeds for the Port Angeles Waterfront from the Alaska Aleutian Subduction Zone earthquake scenario. Orange to darker orange colors represent current speeds between 5 – 8 knots, respectively.

from the AASZ scenario, although strong and unusual currents were still modeled at the entrances to the Port Angeles Boat Haven (see Figure 1) and Travis Spit in Sequim Bay. Despite the limited inundation across the area, this scenario still poses a risk to maritime infrastructure and the boating community. In the CSZ scenario, more than a dozen feet of water inundates the entire Port Angeles waterfront (see Figure 2), including the Ediz Hook. Additionally, extreme current speeds will create massive eddies and whirlpools in Port Angeles Harbor and Sequim Bay.

Of note in this strategy was the USCG representation on the core project team. Ediz Hook, the land formation that constrains the Port Angeles Harbor to the west and north, is home to the USCG Station and Air Station Port Angeles. Having USCG representatives actively participating in these critical discussions was essential to maximize life safety and the protection of critical assets for tsunami response for the Port Angeles area.

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NTHMP PARTNER UPDATES

A Tsunami Maritime Response and Mitigation Strategy for the Port Angeles Harbor and John Wayne Marina is Published!

By Ethan Weller, Washington State Emergency Management Division

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Additionally, the Port has taken significant steps to improve their resiliency to tsunamis by burying fuel tanks underground and utilizing best practices in their design of the floatation and connecting portions of their docks, making this the second consecutive strategy in which some mitigation actions were labeled as 'Complete'. The story is the same for tsunami response: the Port has taken key actions to improve their internal coordination by establishing notification processes and establishing procedures to quickly shut down their infrastructure, amongst others. Moving ahead, the Port is working to incorporate taller, thicker pilings into their marinas as part of planned refloats for the Port Angeles Boat Haven and John Wayne Marina and is actively installing additional tsunami signage across their properties.

The completion of this strategy marks another step forward for understanding tsunami hazards and risk in Port Angeles and can serve as a critical planning tool for years to come. The Port's continued dedication to improving their resiliency will benefit the Port Angeles maritime sector and can act as a model for other communities seeking guidance when it comes to tsunami response and mitigation.

Other strategies completed for Washington include the Port of Bellingham, Westport Marina, Port of Anacortes, Port of Neah Bay, and City of Bainbridge Island's Eagle Harbor. You can find all published strategies at mil.wa.gov/tsunami.

California Tsunami Education and Outreach Preparing the Public and Emergency Personnel for Tsunamis

By The California Tsunami Program

The California Tsunami Program (CTP) engaged in many events during Fall 2025 to increase tsunami hazard awareness and preparedness including public education and outreach and tsunami response table-top exercises (TTX) and training with emergency personnel across multiple levels of government. Recent tsunami alert notifications and response operations resulting from the July 29, 2025 Kamchatka M8.8 and December 5, 2024 Off-shore Cape Mendocino M7.0 earthquakes have shown that a better-informed public and well-prepared emergency response community increase the likelihood of successful tsunami response.

The CTP leveraged local education and outreach events in Northern California to promote tsunami and earthquake preparedness:

San Francisco Fleet Fest

The Cal OES Tsunami Program hosted an information booth at the October 2025 San Francisco Fleet Fest to educate visitors about tsunami hazards and preparedness. San Francisco Fleet Fest brings together thousands of people, enhancing cooperation and the sharing of knowledge between civilian and military personnel. This year's San Francisco Fleet Fest was located adjacent to San Francisco's Pier 39, a famous and popular tourist destination, which provided opportunities to engage visitors to California's Coast who were unfamiliar with tsunami and earthquake hazards.

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NTHMP PARTNER UPDATES

California Tsunami Education and Outreach Preparing the Public and Emergency Personnel for Tsunamis

By The California Tsunami Program

(Continued from page 12)

Pastels on the Plaza is an annual event hosted by North Coast Children's Services in Humboldt County, CA. Participants use sidewalk chalk to design artwork and a message for a sidewalk square. The artwork and messages remain on display for the community until the first fall rains wash them away. The Redwood Coast Tsunami Work Group has regularly participated in this event. The combination of art with safety messaging is an engaging way to promote ShakeOut and World Tsunami Awareness Day education and outreach with the public.

Response Planning and Exercises

Multiple tsunami table-top exercises (TTX) and trainings were conducted to ready emergency response personnel in California for the next tsunami event. Tsunami response training was conducted for the California State Operations Center to familiarize staff, who must be ready for all hazards across California, with tsunami hazard, alerting, and coordination processes. An additional training and TTX was conducted with Cal OES Region staff who work directly with local entities throughout California's coastal communities.

The CTP provided technical support and participated in a State-level California State University (CSU) System TTX to exercise response to a Cascadia subduction zone tsunami and earthquake scenario for affected campuses.



Redwood Coast Tsunami Work Group's Pastels on the Plaza design in October 2025. Message promoted participating in ShakeOut as well as World Tsunami Awareness Day.



Training for tsunami hazard, alerting, and coordination processes followed by a tsunami TTX were conducted with Cal OES Region staff in September 2025.

At the local-level, the CTP worked with Santa Cruz County Central Fire to conduct a tsunami response TTX for the region. This TTX built upon an exercise conducted last year at the Santa Cruz Harbor. State and local entities hope to build upon these last two tsunami TTX exercises in Santa Cruz County and are discussing the development of a tsunami functional exercise.

The California Tsunami Program would like to thank our partners at NOAA/National Weather Service (NWS) including the National Tsunami Warning Center (NTWC) and California NWS Weather Forecast Office's (WFOs) for their support and participation in facilitating tsunami training and exercises in our State. Additionally, support for the much necessary tsunami preparedness events highlighted in this article are made possible through funding from the National Tsunami Hazard Mitigation Program.

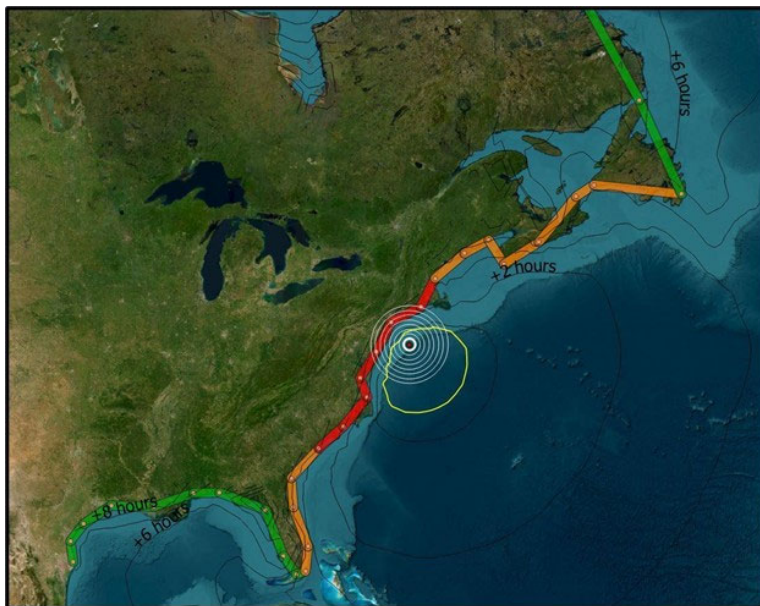
NTHMP PARTNER UPDATES

LANTEX25: NTWC Exercise Supports U.S. & Canadian Atlantic Coast Readiness

by Kara Sterling, Summer Ohlendorf, David Snider, and Christopher Popham

U.S. National Tsunami Warning Center, Palmer, AK

Annually, the National Tsunami Warning Center (NTWC) conducts live, coordinated demonstrations in support of core partner exercises to practice tsunami preparedness. This year's tsunami exercise for the Atlantic, LANTEX25, was delivered on November 18, 2025. The scenario involved a significant magnitude 6.8 earthquake and subsequent underwater landslide occurring off the New England coast near the continental shelf break, which necessitated Tsunami Warnings and Advisories over a 15-hour period. While submarine landslides are infrequent events, their occurrence is well-documented, and they represent the most substantial tsunami hazard for the East Coast of the U.S. and Canada. Modeling and research derived from tsunami mitigation studies conducted through the National Tsunami Hazard Mitigation Program (NTHMP) were utilized in the development of the scenario timeline and associated impacts.



Bulletin #2: Tsunami alert areas 40 minutes after the start of the event. Tsunami travel time contours in hours are shown in black, with the projected "tsunami leading edge" at this time step shown in yellow.

NTWC staff used this event focus to review Atlantic landslide response protocols and tsunami event briefing practices. Leading up to November, exercise participation doubled from last year's participation. The NWSchat Atlantic basin Tsunami partner channel for tsunami event Impact-based Decision Support Services (IDSS) acquired a significant number of new members, improving readiness and access. Agencies such as FEMA, the U.S. Coast Guard (USCG), and teams from state and local emergency management, were actively preparing for a day of simulated tsunami response and event coordination.

Although the original plan for a full-scale event shifted due to the pause on non-mission-critical activities during the six-week government shutdown, NTWC pivoted quickly and transformed the LANTEX25 scenario into a focused two-hour tabletop exercise exclusively for NWS partners.

Partner survey responses were positive, highlighting the value of IDSS briefings delivered via Google Meet, the utility of the dedicated NWSchat coordination channel, and the hands-on practice with the local WFO EAS Tsunami GUI application. The tabletop proved effective in reinforcing communication workflows and operational awareness.

Despite being scaled down from its original concept, LANTEX25 was successful in strengthening relationships and refreshing training on standard operating procedures during tsunami event response. NTWC looks forward to building on this momentum in next year's exercise, with the expectation of broader participation and expanded preparedness activities.

NEW TSUNAMI RESEARCH

Coral Skeletons Left by a Medieval Tsunami Whisper Warning for Caribbean Region

By Gillian Dohrn, University of Washington News

Sometime between 1381 and 1391, an earthquake exceeding magnitude 8.0 rocked the northeastern Caribbean and sent a tsunami barreling toward the island of Anegada.

Flooding scattered debris across the island, depositing coral boulders hundreds of meters inland. The corals died but their skeletons remain. More than six centuries later, scientists are learning that these skeletons hold clues about tsunami history. Computer models showed the flooding likely resulted from a tsunami generated during a large earthquake in the nearby Puerto Rico Trench.

Now, in an open-access paper recently published in Geophysical Research Letters, researchers narrow the tsunami time frame to the last decades of the 14th century. The researchers expect this finding to support ongoing efforts to prepare for future Caribbean tsunamis.

“If you’re designing a school or a hospital near the coast, you want to know whether there’s a chance that a very big earthquake could occur, and you want to design that building to withstand it,” said corresponding author Brian Atwater, a University of Washington affiliate professor of Earth and space sciences and research geologist with the United States Geological Survey.

Anegada is the northernmost of the British Virgin Islands, sitting just south of the Puerto Rico Trench, where the Caribbean and North American plates converge. Most of the islands are protected by a broad, shallow continental shelf. Waves lose energy as they roll across the expanse, decreasing the chances of a tsunami hitting Caribbean shores. Anegada is different — the seafloor slopes steeply toward the deep trench, making the island more hazard prone.

Written records from the northeastern Caribbean go back five centuries, but none provide evidence for a tsunami from the Puerto Rico Trench. Geology allowed the researchers to evaluate tsunami history on a longer timescale.

Researchers began surveying the region after a massive earthquake and tsunami struck the Indian Ocean in 2004, killing more than a quarter of a million people.

The disaster surprised everyone, including researchers, prompting officials in the U.S. to take a closer look at coastal hazards on the Atlantic seaboard. Uri ten Brink, one of the project leads and a research geophysicist at Woods Hole Coastal and Marine Science Center, asked Atwater to check for signs of similar activity on Anegada. Atwater spent years in Indonesia after the tsunami.



An earthquake between 1381 and 1391 triggered a tsunami in the northeastern Caribbean sea that stranded large coral boulders hundreds of meters inland on Anegada, the northernmost of the British Virgin Islands. A new University of Washington-led study dates the event based on analyses of the coral. Co-author Robert Halley is pictured beside a specimen. (Photo credit: Brian Atwater/United States Geological Survey)

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NEW TSUNAMI RESEARCH

Coral Skeletons Left by a Medieval Tsunami Whisper Warning for Caribbean Region

By Gillian Dohrn, University of Washington News

(Continued from page 15)

The evidence uncovered on Anegada drew various research teams to the island and produced a series of discoveries.

In the most recent study, led by [Hali Kilbourne](#), an associate research professor at the University of Maryland Center for Environmental Science, the researchers present a time frame for the medieval tsunami based on how old the coral was when it died.

They calculated age by measuring two radioactive elements — uranium and thorium — that decay at known rates. These measurements were made on samples from the inside of the coral skeletons, due to weathering and potential contamination. The researchers then added the number of annual growth bands between the dated sample and the exterior of the coral to estimate when the tsunami occurred.

“Corals have annual density bands, much like tree rings,” Kilbourne said. “We were able to count how many years passed between the top density bands and the sections we used for dating.”

Kilbourne can also gather valuable environmental data from the coral skeletons, which store information about temperature and salinity, and plans to continue studying the samples to better understand climate change over longer timescales.

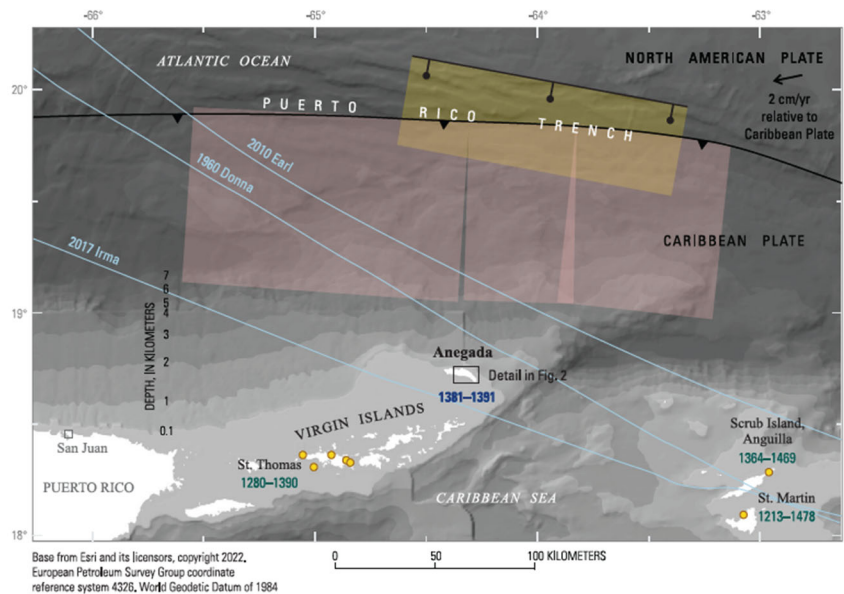
For more information, contact Atwater at atwater@uw.edu or Kilbourne at kilbourn@umces.edu.

Additional co-authors include [Jennifer Weil-Accardo](#) and [Nathalie Feuillet](#) at Paris Institute of Earth Physics; [Pierre Deschamps](#) at Aix-Marseille University; [Yuan-yuan Xu](#) at the University of Delaware; [Chuan-Chou Shen](#) at National Taiwan University and [Robert B. Halley](#) at Colorado Mesa University and the United States Geological Survey.

This research was funded by the U.S. National Science Foundation, the University of Paris-IPGP, the French National Research Agency, Academia Sinica, the Higher Education Sprout Project of the Taiwan Ministry of Education, the National Taiwan University Core Consortiums Project, the Taiwan National Science and Technology Council.

Link to original article: <https://www.washington.edu/news/2025/10/16/coral-left-by-tsunami-warns-caribbean/>

Link to Geophysical Research Letters paper: <https://doi.org/10.1029/2024GL114448>



This map shows Anegada relative to the Puerto Rico Trench, where the Caribbean and North American plates meet. It includes the path of three recent hurricanes to show why it was difficult for the researchers to determine what moved the coral. (Credit: Atwater et al./ Geophysical Research Letters)

NEW RESEARCH & TSUNAMI EVENTS/CONFERENCES

RESEARCH

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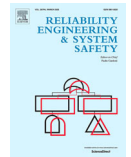
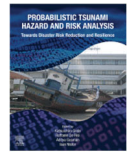
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UPCOMING NTHMP & RELATED EVENTS

- ◆ December 15-19, 2025—AGU Fall Meeting (New Orleans, LA)
<https://www.agu.org/annual-meeting>
- ◆ March 19, 2026—CARIBE WAVE 26 Tsunami Exercise
<https://tsunami.ioc.unesco.org/en/caribewave26>
- ◆ April 14-18, 2026—Seismological Society of America Meeting (Pasadena, CA)
<https://meetings.seismosoc.org/>

AGU25
New Orleans, LA | 15-19 December 2025

