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California Tsunami Program Receives Award for Tsunami Playbooks

By Yvette LaDuke, Tsunami Planning Coordinator Cal OES



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On Wednesday, October 11, 2017, Kevin Miller, Tsunami Program Officer for California Governor’s Office of Emergency Services (Cal OES) and Rick Wilson, Senior Engineering Geologist at California Geological Survey will receive the California Emergency Services Association Special Recognition Award on behalf of the California Tsunami Program.

Kevin and Rick were chosen as recipients for this award based on their work in developing the Tsunami Evacuation Response Playbooks (Playbooks). These Playbooks are currently in use by several coastal communities (including maritime communities) in California and will be completed for the entire California coast by December 2017. Local emergency managers are using the Playbooks to inform tsunami evacuation planning. In addition, other U.S. States and Territories have shown interest in developing Playbooks for their communities based on the work done by Kevin and Rick.



Rick Wilson and Kevin Miller receiving the California Emergency Services Association Special Recognition Award. Credit: California Emergency Services Association

Background: The response to the 2010 Chile and 2011 Japan tsunamis brought to light the desire by California coastal emergency managers to have access to more detailed information regarding the potential hazard and impact of a tsunami ahead of its arrival. The issue was that the existing “worst-case scenario” evacuation approach led to either no evacuation or to over-evacuation, causing undue impacts to coastal stakeholders and unnecessary economic impacts to communities including businesses, residents and local government entities.

Playbook Project: The Tsunami Playbooks offer evacuation options that did not previously exist to local emergency managers. This new approach will enable local decision-makers to base evacuation decisions on a specific tsunami scenario. A recent evaluation of the Playbook approach revealed that California could reduce by half the number of unnecessary residential and business evacuations, saving California approximately \$140 million in evacuation and business closure costs.



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TsuInfo Alert

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<http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis/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.

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By Yvette LaDuke, Tsunami Planning Coordinator Cal OES

(Continued from page 1)

The Playbooks provide background information for identifying areas where flooding on land and strong, damaging currents in harbors could occur during a tsunami event. These secondary evacuation plans incorporate the FASTER approach, which is a calculation that uses forecasted tsunami amplitudes, storm surge, and tidal information to help guide what areas below a certain elevation may be impacted by the tsunami. The State and the National Weather Service work together to make these Playbooks operational, real-time evacuation and response tools for local decision-makers.

Throughout the Playbook development process, the California Tsunami Steering Committee, comprised of all coastal county emergency managers in California and chaired by Kevin and Rick, served as a guiding policy forum for approving, implementing, and testing the Playbooks. The materials have been tested via statewide exercises and were put into use during the 2015 Chilean Tsunami Advisory.

Playbook Implementation: Rick and Kevin travel up and down the California coast to work with local emergency managers and other officials, ensuring that the modeling and mapping necessary to identify the inundation zones matches real world conditions which support Playbook Plan recommendations in each coastal community and harbor area. It is vital to incorporate local decision-makers into the process to receive their input and feedback. Finally, after each Playbook is finalized, Kevin and Rick work with the local jurisdictions to incorporate the Playbook into their Local Response Plan, and provide workshops, presentations, trainings, meetings, and exercises as desired, for the local community.

NTHMP NEWS

FY17 NOAA/NWS Tsunami Activities Grants Awarded

By Rocky Lopes, NOAA/National Weather Service Tsunami Program

NOAA's National Weather Service is pleased to announce \$5,892,849 in grant funds have been awarded or transferred within NOAA to support projects to make coastal communities throughout the United States and its territories safer from tsunamis. Grants are provided to coastal states, territories, and entities who subscribe to the goals and high-priority public safety strategies of the National Tsunami Hazard Mitigation Program (NTHMP).

FY17 NOAA/NWS grants for the performance period from September 1, 2017, through August 31, 2018 or 2019, have been awarded to 12 state and territory government entities to support these tasks.

After thorough review and judging of grant task requests with priorities of the NTHMP and NOAA/NWS, the NTHMP Grant Review Panel recommended, and the NTHMP Chair approved, a commitment of \$5,999,580 in total grant awards. However upon rigorous and thorough Federal Government review by NOAA Grants Specialists between May and August,

some grants were reduced when more information and details indicated lower costs due to more precise cost estimates, changes in some applicant's indirect cost rates, and recalculation of some grant requests after resolving mathematical errors.



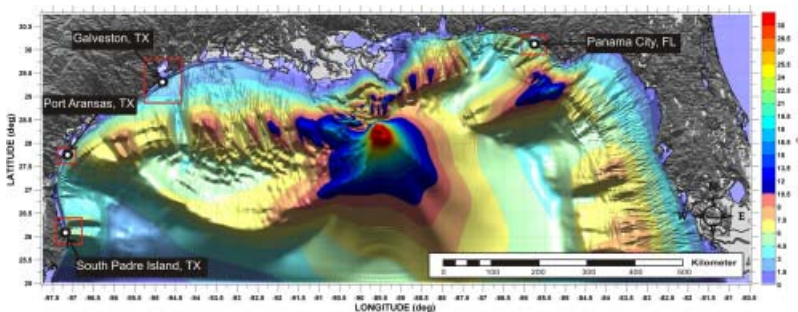
Tsunami evacuation drill in Oregon



Siren on American Samoa

The variety and number of tasks are an example of the difficult and challenging work undertaken by NTHMP partners to fulfill the NTHMP Mission "to mitigate the impact of tsunamis through public education, community response planning, accurate hazard assessment, and inform the warning process."

Note: due to the devastating impacts of Hurricanes Irma and Maria on Puerto Rico and the U.S. Virgin Islands in September, grant awards for these locations will be extended and on request of the recipients, reprogrammed for high-priority restoration requirements for previously-approved tsunami-related infrastructure, signage, and other needs. NOAA/NWS extends grace, flexibility, and understanding to our storm-impacted grant recipients.



Tsunami modeling in the Gulf of Mexico

A full description of the tasks that FY17 NOAA/NWS grants are supporting are on the NTHMP website, here:

<http://nws.weather.gov/nthmp/grants/2017grants/index.html>

Report Summarizes Tsunami Impacts from September 7, 2017, M8.1 Chiapas, Mexico, Earthquake

By Rick Wilson, California Geological Survey

The tsunami impacts during the September 7, 2017, M8.1 Chiapas, Mexico Earthquake, have been summarized in the following report for the Earthquake Engineering Research Institute (EERI), titled: “EERI Preliminary Notes on Tsunami Damage and Response: Tsunami Generated by M_w 8.1 Chiapas, Mexico, Earthquake on September 7, 2017.” The report was co-authored by Rick Wilson, Maria-Teresa Ramirez-Herrera, Lori Dengler, Kevin Miller, and Yvette LaDuke, and published on the EERI website: https://www.eeri.org/wp-content/uploads/EERI-Recon-Rpt-090717-Mexico-tsunami_fn.pdf Although the tsunami impacts were not as significant as those from the earthquake itself (98 fatalities and 41,000 homes damaged), the following are highlights and lessons learned summarized in the tsunami report:

1. The Chiapas earthquake was one of the largest down-slab normal faulting events ever recorded. This situation complicated the tsunami forecast since forecast methods and pre-event modeling are primarily associated with megathrust earthquakes where the most significant tsunamis are generated. Adding non-megathrust source modeling to the tsunami forecast databases could be considered and added to conventional warning systems like those run by the U.S. Offshore seismic and tsunami hazard analyses using historical and pre-historical events should incorporate the potential for large earthquakes occurring along sources other than the megathrust boundary.
2. From an engineering perspective, initial reports indicate there was only minor damage along the Mexico coast. There was damage to Marina Chiapas harbor where floating docks overtopped their piles (Figure 1). Increasing pile heights could reduce the potential for damage to floating docks.
3. Tsunami warning notifications did not get to the public in time to assist with evacuation. Streamlining the messaging in Mexico from the warning system directly to the public should be considered. And, for local events, preparedness efforts need to place emphasis on responding to feeling the earthquake and not waiting to be notified or observe additional effects such as waiting for the water to drawdown.
4. Although the U.S. tsunami warning centers were timely with their international and domestic messaging, there were some issues with how those messages were presented and interpreted. The use of a "Tsunami Threat" banner meant to convey an alert to international visitors on the main combined tsunami warning centers website created confusion with emergency managers where no tsunami threat was expected to exist. Also, U.S. states and territories in the Pacific were listed in both domestic and international messages, which caused confusion for American Samoa where these messages contained somewhat conflicting information. It is the authors' understanding that these issues are being addressed by the warning centers, and there will be follow up with the warning centers during future meetings of the U.S. National Tsunami Hazard Mitigation Program.



Figure 1: Video screen captures of dock damage in Marina Chiapas the day after the September 7, 2017, earthquake. According to the videographer, the amplitude of the tsunami in this area was several meters causing the floating docks to overtop the piles, and damage to the docks themselves (video link: <https://www.youtube.com/watch?v=bBBVtIwLM9g>).

NTHMP NEWS

TsunamiReady® Recognition Milestones

By Rocky Lopes, NTHMP Administrator

As of September 30, 2017, there are 199 sites recognized as TsunamiReady. During the period from April 1, 2017, to September 30, 2017, the following sites received the first TsunamiReady recognition:

- Manoa, Hawaii
- Whittier, Alaska



With Aina Haiha, Hawaii receiving recognition earlier in the year, there were three new TsunamiReady Communities recognized during FY17. That is about what we expected since we anticipated reaching the “saturation point” with most communities in high- and moderate-risk areas recognized as TsunamiReady.

The following communities renewed their TsunamiReady recognition between April 1, 2017, and September 30, 2017:

- Calabash, North Carolina
- Cannon Beach, Oregon
- Clatsop County, Oregon
- Cordova, Alaska
- Hoquiam, Washington
- Honolulu County, Hawaii
- Huntington Beach, California
- Laguna Beach, California
- Lincoln City, Oregon
- Lower Elwah Tribe, Washington
- Naval Base Coronado, California
- New Hanover County, North Carolina
- Oxnard, California
- Pender County, North Carolina
- Rockaway, Oregon
- San Diego, California
- San Francisco County, California
- Sea World, California
- Seward, Alaska
- Shoalwater Bay Tribe, Washington

Unfortunately, there were no TsunamiReady Supporter sites recognized during FY17.

Note: considering the impact of hurricanes on Puerto Rico and the U.S. Virgin Islands, each of these territories 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.

UN Calls on World to Observe World Tsunami Awareness Day: November 5

In December 2015, the United Nations General Assembly designated November 5 as World Tsunami Awareness Day, calling on all international bodies, countries, nongovernmental organizations, and individuals to use the day to raise tsunami awareness and share innovative approaches to risk reduction both before and after a tsunami. For the second year in a row, the World Tsunami Awareness Day will align with the International Day for Disaster Reduction and the "Sendai Seven Campaign." This year, the two campaigns are focusing on the second target of the Sendai Framework for Disaster Risk Reduction, which aims to "reduce the number of affected people globally" by disasters.

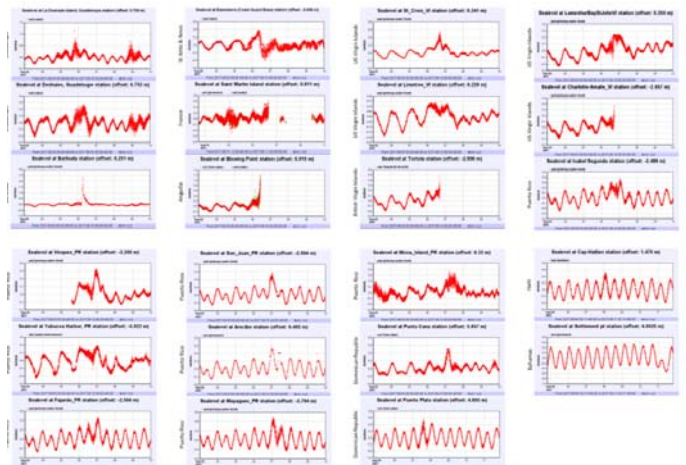
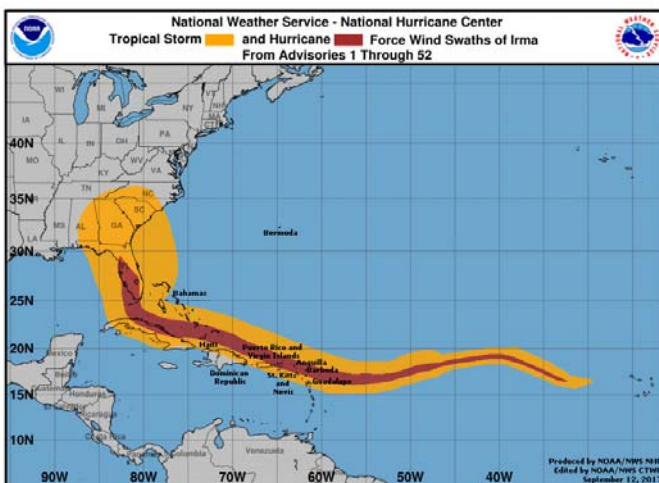
November 5 was chosen to honor the actions of a Japanese farmer and village chief credited with saving hundreds of lives from a tsunami in 1854. After recognizing the signs of a tsunami, he set fire to his harvested rice to attract the attention of villagers near the coast. As the villagers rushed to help, he told them to keep moving up the hill to safety, where they watched the tsunami destroy their village. In the aftermath, he helped his community rebuild to better withstand future events for the benefit of future generations.



To support World Tsunami Awareness Day and help promote the global culture of tsunami awareness, the National Weather Service includes tsunamis in its fall safety campaign. Tsunami-related social media messages that can be adapted to incorporate World Tsunami Awareness Day are available at <https://www.weather.gov/wrn/fall2017-tsunami-sm>.

Help spread the word about World Tsunami Awareness Day! On the Web, visit <http://www.unisdr.org/2017/tsunamiday/> to learn more. On social media, use hashtags #TsunamiDay2017 and #TsunamiPrep.

UNESCO IOC CARIBE EWS Sea Level Stations Network Recorded the Effect of Hurricane Irma Across the Northern Caribbean and Adjacent Regions (September 5-11, 2017)



See original posting on CTWP website: <https://www.weather.gov/ctwp/>

RESEARCH & NTHMP NEWS

The Legacy of the 1992 Nicaragua Tsunami

By Nicolas Arcos, Paula Dunbar, Kelly Stroker, and Laura Kong

On the night of 1 September 1992, a deadly tsunami struck the Pacific coast of Nicaragua with little or no warning, triggered by a nearby earthquake. Early newspaper reports indicated waves almost 15 meters high swept away houses, boats, vehicles, and anything in their path [Globe and Mail, 1992].

The earthquake and tsunami left at least 170 people dead, approximately 500 injured, and more than 13,500 homeless. The tsunami caused most of the damage.

Following the earthquake, the National Oceanic and Atmospheric Administration (NOAA) Pacific Tsunami Warning Center (PTWC) did not issue a tsunami warning. That's because the earthquake's initial surface wave magnitude (M_s) was only 6.8 and lower than their warning threshold. However, analysis of seismic signatures would later show that the earthquake's moment magnitude (M_w), a better representation of the total energy radiated by the earthquake, was 7.7.

Close to the source, many people also underestimated the magnitude of the earthquake on the basis of the shaking. Often, strong earthquake ground shaking serves as a natural warning sign of an impending tsunami, so that coastal communities can evacuate. But in this case the ground shaking was weak or soft. The source was only about 100 kilometers away, so why didn't many coastal residents feel the earthquake, and why was the ensuing tsunami so high?



A photograph taken near the town of Popoyo, Nicaragua, during a post-tsunami survey following a $M_w = 7.7$ earthquake that struck Nicaragua's Pacific coast on 1 September 1992 local time. Here sedimentologist Jody Bourgeois, part of the first ever International Tsunami Survey Team (ITST), takes notes 3 weeks after the event at a house destroyed by the tsunami. Tsunami wave height reached almost 6 meters in this coastal town; most houses were washed away. Credit: Harry Yeh/NCEI

See full article: <https://eos.org/features/the-legacy-of-the-1992-nicaragua-tsunami>

Joint NZ-US Mission to Upgrade Tsunami Warning Station

By National Institute of Water and Atmospheric Research (NIWA), New Zealand

A tsunami reporting station situated in the Pacific Ocean that is currently off line is to be upgraded in a joint operation involving New Zealand and United States government agencies.

The New Zealand government is co-funding an operation with the US National Oceanic and Atmospheric Administration (NOAA)'s National Weather Service.

The operation will replace equipment on the Deep-ocean Assessment and Reporting of Tsunami (DART) station, known as Station 54401, which is situated 1185km north-east of Auckland.

Station 54401 comprises a surface buoy and a bottom pressure recorder (BPR) sitting on the ocean floor, nearly 6km below the surface.



DART buoy (Deep-ocean Assessment and Reporting of Tsunamis). Photo credit: NOAA

See full article: <https://www.niwa.co.nz/news/joint-nz-us-mission-to-upgrade-tsunami-warning-station>

RESEARCH & NTHMP EVENTS

CURRENT TSUNAMI RESEARCH

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Rabinovich, A. B.; Titov, V. V.; Moore, C. W.; Eble, M. C., 2017, The 2004 Sumatra Tsunami in the Southeastern Pacific Ocean: New Global Insight From Observations and Modeling: *Journal of Geophysical Research Ocean*, DOI: 10.1002/2017JC013078.



Sepulveda, Ignaico; Liu, P.L.-F.; Grigoriu, Mircea; Pritchard, Matthew, 2017, Tsunami hazard assessments with consideration of uncertain earthquake slip distribution and location: *Journal of Geophysical Research Solid Earth*, DOI: 10.1002/2017JB014430.

Stolle, Jacob; Takabatake, Tomoyuki; Mikami, Takahito; Shibayama, Tomoya; Goseberg, Nils; Nistor, Ioan; Petriu, Emil, 2017, Experimental Investigation of Debris-Induced Loading in Tsunami-Like Flood Events: *Geosciences*, v. 7, no. 3, p. 74, doi:10.3390/geosciences7030074. <http://www.mdpi.com/2076-3263/7/3/74>



UPCOMING NTHMP & RELATED EVENTS

- ◆ October 22-25, 2017—GSA Annual Meeting (Seattle, Washington)



<http://community.geosociety.org/gsa2017/home>

- ◆ December 11-15, 2017—AGU Fall Meeting (New Orleans, Louisiana)



<https://fallmeeting.agu.org/2017/>

- ◆ January 29-February 2, 2018—NTHMP Annual Meeting (Seattle, Washington)



<http://nws.weather.gov/nthmp/>

- ◆ February 11-16, 2018—AGU Ocean Sciences Meeting (Portland, Oregon)



<https://osm.agu.org/2018/>

- ◆ April 24-26, 2018—Joint Conference of the Latin American and Caribbean Seismological Commission and the Seismological Society of America (San Juan, Puerto Rico)



<http://seismology2018.org/>

- ◆ May 7-9, 2018—8th International Symposium on Submarine Mass Movements and Their Consequences (Victoria, British Columbia)



<http://igcp640.oceannetworks.ca/>