TsuInfo Alert

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National Tsunami Hazard Mitigation Program
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DECEMBER 2019 Volume 21, Number 6

Fair Winds and Following Seas Rocky!

By Michael D. Angove, NOAA/NWS Tsunami Program Lead

It is with heavy hearts that we bid a fond farewell this month to our long-time NTHMP Administrator, Dr. Rocky Lopes. Rocky is a certified emergency manager by profession, but we know him as a tireless consensus-builder, a meticulous organizer, and most importantly a committed friend and trusted confidant across the entirety of his professional and community life. Before joining NOAA and serving the NTHMP, he had a long and distinguished career at the American Red Cross National Headquarters (1985 – 2004), culminating in his appointment as Director of Disaster Preparedness in 1999. By coincidence, Rocky was on holiday in Australia when the 2004 Indian Ocean earthquake and tsunami occurred. He served as an Australian Red Cross volunteer on tsunami relief activities for three months primarily in Indonesia.

Rocky began working full-time as a Contractor at the National Weather Service (NWS) in 2009 and has been supporting the NTHMP ever since. He was appointed NTHMP Administrator in 2013. In October 2014 he was named NOAA Team Member of the Month by the NOAA Administrator, Dr. Katherine Sullivan. Rocky has earned bachelor's degrees in education & microbiology, has received a Master's degree in Administration, and holds a PhD in Sociology.

Rocky's list of accomplishments and contributions to the NTHMP and the Nation are long, a few of which include:

- Migration of the NTHMP website from NOAA's Pacific Marine Environmental Lab to NWS Headquarters and increasing the information provided on it or linked from it by more than a factor of five (201 pages to 1092 pages).
- Creation of the *TsuInfo Alert* (NTHMP newsletter) Editorial Board to provide support and oversight of this bimonthly publication.
- Development of *Safer U.S. Shores: FY08-FY15 Grant Investment Activities Report* – the first thorough analysis of how grant investments have been applied. (Subsequent annual updates produced each year on the NTHMP website.)

(Continues on page 2)

IN THIS ISSUE:

TsuInfo Alert

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NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:
http://d92019.eos-intl.net/D92019/OPAC/Index.aspx

Fair Winds and Following Seas Rocky!

By Michael D. Angove, NOAA/NWS Tsunami Program Lead

(Continued from page 1)

- Production of *NTHMP Annual Reports* (2015, 2016, 2017, and 2018) that give a glimpse of each partner's and NTHMP subcommittees' tsunami-related activities for the past year.
- Organized and facilitated 12 NTHMP biannual meetings, including two that were severely impacted by Government shutdowns.
- Supported 42 meetings of the NTHMP Coordinating Committee, including production of minutes with approval and distribution usually the next day after the meeting.
- Facilitated over 250 meetings engaging NTHMP partners for various tasks, some as mundane as planning the annual meeting agenda, to more substantive considerations such as negotiating on rules changes and strategic planning.
- Updated all NTHMP Governance documents for the NTHMP and its subcommittees, caucus, and Work Group. (Some of them more than once!)
- Facilitated and produced external *NTHMP Assessment* in 2017.
- Created a truly strategic, "evergreen" *2018-2023 NTHMP Strategic Plan*.

Rocky is looking forward to joining his husband Chuck on well-deserved trips to his beloved Caribbean, and epic motorcycle rides through the American West. Even in "retirement", we know that Rocky's calling to serve will never cease and never be satisfied. We were fortunate to have been served by Rocky during his time at NWS, and look forward with gratitude as he moves on to serve others.

Fair Winds and Following Seas Rocky. May you always hold the High Ground!

NTHMP 10-Year Retrospective: We've Come a Long Way, Baby!

By Rocky Lopes (retiring NTHMP Administrator)

I was delighted to be hired as a contractor by the National Weather Service (NWS) Headquarters Tsunami Program 10 years ago. As I head into retirement when my contract is terminated on December 31, 2019, I wanted to reflect back on the journey that the National Tsunami Hazard Mitigation Program (NTHMP) has gone through during my tenure.

Left to right: Mike Angove, Rocky Lopes, Chip McCreery, and James Gridley

To provide perspective, in response to the 2004 Indian Ocean tsunami, when more than 230,000 people died and the National Oceanic and Atmospheric Administration (NOAA) and U.S. Geological Survey (USGS) scientists gained a heightened awareness the United States could face similar threats along its shores, the U.S. Congress passed the *Tsunami Warning and Education Act* ("TWEA" P.L. 109-479) in late 2006. This act provided the foundation for the NTHMP expansion from its five core states supported only by NOAA, to serve 28 U.S. coastal states and territories along with three federal agencies: the Federal Emergency Management Agency (FEMA), the USGS, and NOAA, with NOAA's National Weather Service as the sponsoring agency. It was passed because Congress was very concerned about a catastrophic tsunami event happening on U.S. shores, and our country needed to be better prepared and improve its tsunami detection and alerting capabilities. The NTHMP's Federal, State, and Territory partnership became the vehicle to realize the intent of this legislation.

Further, Congress directed an unprecedented infusion of funding to the NOAA Tsunami Program, which included money for tsunami preparedness to the last mile for coastal states and territories. The funding increased from $50,000 per year to each of five states prior to 2008 to as much as $9M per year (until 2011, stabilizing at $6M/year since then). The funds were divided among all coastal state and territory partners based on priorities to assist them to fill gaps in tsunami preparedness and to build coastal resilience. Since FY08, grant investments in tsunami work by coastal partners have exceeded $61 Million.

Given the dramatic expansion and influx of funding, there were times when the NTHMP members were at odds with each other and with the NTHMP chair, primarily over how to prioritize and allocate this new funding. There were few, if any, consistent approaches to action–from modeling to mapping to public warning to informing emergency managers to conducting outreach, and even to tsunami signage. Each area had its own unique approaches that were all different.

These inconsistencies were highlighted in a programmatic review by the National Academies of Science, which provided Congress, the NWS, and the NTHMP numerous recommendations on improving program delivery and increasing national consistency.

(Continues on page 4)

NTHMP 10-Year Retrospective: We've Come a Long Way, Baby!

By Rocky Lopes (retiring NTHMP Administrator)

(Continued from page 3)

From 2009 to 2011, through the lens of my expert background in social science, I observed and listened while working to support the outreach and education side of the NTHMP. Then, as the NTHMP stabilized under the gentle but firm support of Jen Rhoades (then NWS Tsunami Program Manager), disagreements were fewer and the attention toward consistency and collaboration grew.

Following Jen Rhoades departure and transitions in program leadership, Mike Angove came aboard as the NWS Tsunami Program Manager in 2012 and took the helm of the NTHMP. He quickly realized that a steady hand to support the NTHMP was needed. I was thrilled and to be honest, somewhat daunted when he asked me to assume that challenge. The NTHMP Chair appointed me as NTHMP Administrator in 2013.

VITEMA Director Mona Barnes and Rocky Lopes

As time progressed and under exceptional leadership of Aimee Devaris (2013-2015) and Dr. Grant Cooper (2015 to present), the NTHMP evolved to become a highly collaborative and successful group. Based on my experience, no other organization engages scientists and emergency managers in the same room at the same time as effectively; this is indeed the most incredible component of what makes the NTHMP so brilliantly successful and a credit to its founders!

Tremendous strides have been made during the last decade. Products were developed that demonstrate consistency of content, design, and message. Mapping and modeling techniques debated by the scientists produced effective results that inform emergency managers and the communities they serve where tsunami danger exists and where to designate for safety. Through collaboration with the NWS, NTHMP support of the TsunamiReady Program saw the number of recognized communities expand from 68 in 2009 to the peak of 210 (the number has declined to 194 as of November, 2019).

Updates to the Federal legislation that provides the foundation of support for the NTHMP, 2006 "TWEA" had been languishing in Congress with several attempts to update it between 2012 and 2017. Finally through a creative approach by Oregon Representative Bonamici, the *Tsunami Warning, Research, and Education Act of 2017* ("TWERA") was appended to "The Weather Act" which had already received widespread bipartisan support. We saw TWERA become law (P.L. 115-25, Title V) in 2017.

This legislation provides a number of suggestions for improvements in the U.S. Tsunami Program at all levels of Government, but none are mandated. The NTHMP Coordinating Committee is still struggling to choose which of the suggestions are most practical and actionable given constraints of budget, time, and personnel. However, the updated legislation couldn't have happened at a better time, because the *2017 NTHMP Review* and *2018-2023 NTHMP Strategic Plan* were developed with this legislation in mind.

(Continues on page 5)

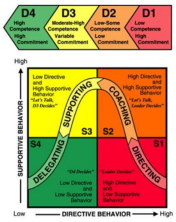
NTHMP UPDATES

NTHMP 10-Year Retrospective: We've Come a Long Way, Baby!

By Rocky Lopes (retiring NTHMP Administrator)

(Continued from page 4)

When I recently looked on the NTHMP website's "Partners Resources Page" (https://nws.weather.gov/nthmp/NTHMP_Web_Resources.html) I counted more than 500 products, maps, educational materials, public information, media items, and reports NTHMP partners have produced during the last 10 years. I am solidly impressed! I am certain that *no other Federal/State/Territory partnership has been nearly as productive as the NTHMP*. I am glad to have been a part of a decade of tremendous growth.



Ten years on as I head out to our nation's safer shores in my retirement (littorally and literally), I am proud of what the NTHMP has become. According to Hershey and Blanchard's work on organizational behavior, through coaching and guidance, the NTHMP has evolved to the D4 level: high competence and high commitment.

I leave the NTHMP on a solid, firm footing, enabled to withstand scouring and pounding of those virtual tsunamis that are inevitable in the future. I am confident the NTHMP will thrive after I am soaking up the sunshine of retirement.

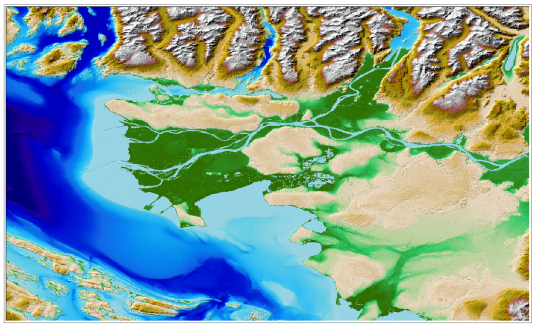
Never again will I have had the opportunity to collaborate with such smart, innovative, thoughtful, and forward-leaning people as we have had in our NTHMP partners. This is really why I am retiring! When you've supported the best, why settle for less?

With warm appreciation always… I remain… your loyal (and former) Cat-Herder-In-Chief

United States-Canada Workshop on Coastal Digital Elevation Model Development

By Christopher Amante, NOAA National Centers for Environmental Information

The tectonic setting and complex physiography of the Washington State and southern British Columbia region pose numerous issues for scientists modeling tsunami inundation. To address the lack of integrated bathymetric-topographic digital elevation models (DEMs) that extend across international borders, the National Oceanic and Atmospheric Administration National Centers for Environmental Information (NCEI) provided instruction on coastal digital elevation models (DEM) at a workshop hosted by Ocean Networks Canada (ONC) at the University of Victoria, British Columbia, September 23-27, and October 21-23, 2019.



Hillshade of the completed digital elevation model that extends across the United States-Canada border and covers the Salish Sea and Lower Mainland of BC.

Christopher Amante and Matthew Love of NCEI led the development of an integrated bathymetric-topographic DEM for the Semiahmoo First Nation at the ONC workshop. NCEI shared methods for developing integrated coastal DEMs with the attending Canadian geospatial and engineering specialists. The completed DEM, which integrated three terabytes of bathymetric and topographic datasets covering the Salish Sea and Lower Mainland, will be used to help protect nearly 2.8 million people along Canada's west coast from tsunamis, storm surge, and other flood-related events. The DEM workshop was part of the West Coast demonstration study of the Canadian Safety and Security Program's Coastal Flood Mitigation Canada Project, led by Natural Resources Canada. If you have questions, please email dem.info@noaa.gov.

News from the Redwood Coast Tsunami Work Group and California's North Coast

By Lori Dengler for the Redwood Coast Tsunami Work Group

The Redwood Coast Tsunami Work Group (RCTWG) has been busy on several fronts. In October during ShakeOut week, the community of Fields Landing conducted a community-wide drill , which is one of the guidelines to being recognized TsunamiReady®, and the community of Manila celebrated becoming the first Tier Two TsunamiReady® Community in the nation (see article about Tier Two in the August Tsuinfo issue https://www.dnr.wa.gov/publications/ger_tsuinfo_2019_v21_no4.pdf). We held our 21st earthquake/tsunami display at the Humboldt County Fair, we are working with the California Geological Survey to revise/update North Coast tsunami maps, and planning is underway to conduct our eighth "live-code" tsunami communications test next March.

Eureka NWS Forecast Office WCM Ryan Aylward at a Manila Community celebration November 2019

The small tsunami boat Kamome continues to make waves on both sides of the Pacific. A little more than two years after the Japan earthquake and tsunami, a small boat washed up in Crescent City, California. More than 60 tsunami debris boats have washed ashore in U.S. and Canadian waters since the March 2011 tsunami, but Kamome was unique. It belonged to Takata High School in Japan and the arrival of the boat inspired a cultural exchange between students in Rikuzentakata, Japan and Crescent City, California. In the spring of 2018, the two cities formally became sister cities, the first such official relationship caused directly by a tsunami. An important part of the sister city connection is exchanging knowledge and ideas to promote earthquake/tsunami awareness and preparedness. There have been five exchanges between students at the two high schools and a number of visits between officials and community members. View a photo history of the Kamome story at https://youtu.be/qHGkoe35CEQ.

2019 RCTWG Humboldt County Fair exhibit

We have established a web site (humboldt.edu/kamome) that includes downloadable pdf links to a children's book now available in five different language versions. An online curriculum is posted under the Activities menu. Eight activities for K-2 are completed, all linked to California curriculum standards. Activities for other grades are under development. A new animation of the Kamome story can be viewed at https://drive.google.com/file/d/18dy6GQndkT7vX8eoFFLfO2cohzLoRovX/view. And, if you happen to be viewing the Tokyo Olympic Games this summer, NBC is making the Kamome story and how it connected California and Japan one of their human-interest features.

Fields Landing Community Wide Tsunami Evacuation Drill

By Todd Becker, Cal OES Tsunami Program

In October 2019, the residents of Fields Landing, Humboldt County, California participated in a community-wide tsunami evacuation drill.

Fields Landing community member and longtime Redwood Coast Tsunami Work Group (RCTWG) member Kathy Moley led the tsunami evacuation drill planning efforts. RCTWG members coordinated the tsunami evacuation drill with support from local emergency management, fire, law enforcement, Community Emergency Response Team (CERT), and transportation with additional support from state and federal agencies.

Outreach activities prior to the drill included a community dinner with presentations about tsunami hazard and preparedness. Local TV, radio, and social media broadcasted additional tsunami educational and drill information. RCTWG members canvased the community and distributed outreach and event information door-to-door prior to the drill.

The tsunami siren initiated the community evacuation on the day of the drill. Local Ham Radio operators provided communication for drill organizers, and the Coast Guard conducted a fly-over. Following evacuation, participants congregated at a point outside the evacuation zone to complete surveys, and organizers distributed additional educational materials.

The Fields Landing community-wide tsunami evacuation drill is a great example of community and government coordination working to mitigate potential loss of life from future tsunamis through education and preparedness.

Christa G. von Hillebrandt-Andrade Elected 2019 AAAS Fellow

Christa G. von Hillebrandt-Andrade, manager of the U.S. NWS Caribbean Tsunami Warning Program (CTWP), has earned the lifetime distinction of American Association for the Advancement of Science (AAAS) Fellow in honor of her many contributions to the field of geology. She will be honored at the ceremony on Feb. 15, 2020, during the AAAS Annual Meeting in Seattle. You can read more about her background and work in the Caribbean with the Puerto Rico Seismic Network and the CTWP in this previous TsuInfo Alert article: https://www.dnr.wa.gov/publications/ger_tsuinfo_2018_v20_no3.pdf.

To find out more about the award and see the full list of 2019 AAAS Fellows, see the official announcement: https://www.aaas.org/news/aaas-announces-leading-scientists-elected-2019-fellows

Tsunami Awareness Day: San José Night Evacuation Drill in Mayagüez, Puerto Rico

By Estela López, San José Security Council, and Roy Ruiz-Vélez, Puerto Rico Seismic Network

San José is a community located by the bay in Mayagüez, Puerto Rico. In 2008, San José established a Community Security Council, which works under the jurisdiction of the Puerto Rico Police Bureau with matters of neighborhood safety and security. There are more than 700 residents in San José, 48% of these are 65 years old or greater, many of whom have mobility limitations. Additionally, the time estimate for the official tsunami evacuation route is 50 minutes or more. Recognizing the community's vulnerability due to these factors and its proximity to the ocean, the Council has been working for years to raise tsunami awareness and to educate the community how to respond if a strong earthquake occurs and a tsunami evacuation is suddenly required. Initially the Council started coordinating evacuation drills during Caribe Wave, in coordination with emergency management agencies and the Puerto Rico Seismic Network (PRSN). In response to recent earthquakes, nighttime drills have also been organized using an alternate evacuation route established by the community, which reduces evacuation time to approximately 20 minutes.

The first night evacuation drill was done on February 15th, 2017 at 7:00 p.m. Walking through zero visibility proved harder than anticipated. In spite of this, the drill was successful because emergency personnel placed along the route were there to guarantee the safety of the participants and to minimize accidents. On November 5th, 2019, World Tsunami Awareness Day, the nighttime tsunami evacuation exercise was repeated. This time around the residents performed significantly better despite the fact that no emergency personnel were there to guide the residents along the evacuation route. The event was considered successful because of the following:

- Prior to the drill an earthquake and tsunami fair was held and the residents had the opportunity to visit the Emergency Management Agency earthquake simulator.
- About 100 people participated in this drill, more than any other prior drill.
- Everybody followed the instructions given by the community leader.
- The drill started and ended in a timely fashion.
- People learned about the new assembly point established by the local Emergency Management Office.
- A resident attended the drill on a wheelchair and made it to the end of the route for the first time.
- The residents of San José were able to interact with the neighbors where the new assembly point was located.

- Participants evacuated in less than 20 minutes.
- The mayor of Mayagüez participated during the drill and was able to understand the challenges residents might experience in case of an emergency evacuation.
- Evaluations demonstrated that most people evacuated in 11 to 20 minutes and found the path clear and without difficulty. For elder residents the evacuation exercise took longer and found it at little difficult.
- People typically expressed having fun participating in these drills.

(Continues on page 9)

Tsunami Awareness Day: San José Night Evacuation Drill in Mayagüez, Puerto Rico

By Estela López, San José Security Council, and Roy Ruiz-Vélez, Puerto Rico Seismic Network

(Continued from page 8)

These exercises are necessary every year in order to keep the residents aware of what needs to be done in case of tsunami warning. It also helps emergency management personnel to better understand the emergency scenario they could be facing and the profile of the communities they will be working with in order to get the necessary resources to be more effective. The challenge remains to reduce the time and the difficulty of the evacuation route, especially for elderly and for those with mobility limitations.

Acknowledgment: Special thanks to the local Emergency Management Office, the Municipality of Mayagüez, its mayor and the municipal administration for all the support provided during the evacuation exercise. Thanks to Dr. Elizabeth Vanacore for her collaboration on this article. PRSN is supported by NOAA NWS Grant NA19NWS4670014 to conduct tsunami preparedness, mitigation, and mapping activities for Puerto Rico.

TsunamiReady® Recognition Milestones

By Rocky Lopes, National TsunamiReady® Program Coordinator

As of December 6, 2019, there are 194 sites recognized as TsunamiReady®.

During the period from June 26 to December 6, 2019:

- The following sites renewed their TsunamiReady® recognition:

- Aguada, PR
- Aguadilla, PR
- Bayamon, PR
- Ceiba, PR
- Depoe Bay, OR
- Florence, OR
- Gold Beach, OR
- Hancock County, ME
- Horry County, SC
- Huntington Beach, CA
- Kodiak, AK
- King Cove, AK
- Lincoln County, OR
- Luquillo, PR
- Manzanita, OR
- Marin County, CA
- Maunabo, PR
- Nehalem, OR
- Newport, OR
- Orange County, CA
- Patillas, PR
- Port Hueneme, CA
- Saipan, CNMI
- Sand Point, AK
- Santa Monica, CA
- Seaside, OR
- Shoalwater Bay Tribe, WA
- Toledo, OR
- Waldport, OR
- Westport, WA
- Wheeler, OR
- Yachats, OR

- There were no new or renewed TsunamiReady Supporter sites during this reporting period.
- Also during this period, the following previously recognized TsunamiReady® sites were not renewed due to lack of interest from local emergency managers. These jurisdictions had been expired for more than one year.
  - Hau'ula, HI
  - San Mateo County, CA

Unfortunately, it is likely that Sonoma County, Dillon Beach, and Carmel-By-The-Sea, California, will also lose recognition by February, 2020, after each of these locations had its recognition be expired for more than one year.

Summary

During this reporting period, the United States added no new and lost two recognized TsunamiReady® communities or counties, reducing the total of U.S. TsunamiReady® recognitions from 196 to 194 as of December 6, 2019.

NWS TsunamiReady® Program: https://www.weather.gov/TsunamiReady/

Tsunami Science and Engineering II (Open Access Book)

Edited by Valentin Heller

Abstract: Earthquake-tsunamis, including the 2004 Indian Ocean Tsunami and the 2011 Tōhoku Tsunami in Japan, serve as tragic reminders that such waves pose a major natural hazard. Landslide-tsunamis, including the 1958 Lituya Bay case, may exceed 150 m in height, and similar waves generated in lakes and reservoirs may overtop dams and cause significant devastation. This book includes nine peer-review articles from some of the leading experts in the field of tsunami research. The collection represents a wide range of topics covering (i) wave generation, (ii) wave propagation, and (iii) their effects. Within (i), a tsunami source combining an underwater fault rupture and a landslide are addressed in the laboratory. Within (ii), frequency dispersion with the nonlinear shallow-water equations is considered and a detailed account of the 1755 Lisbon earthquake, tsunami, and fire in downtown Lisbon is presented. Two articles involve all three phases (i) to (iii), including runup and dam over-topping. Within (iii), a new semi-empirical equation for runup is introduced and the interaction of tsunamis with bridges and pipelines is investigated in large laboratory experiments. This state-of-the-art collection of articles is expected to improve modelling and mitigate the destructive effects of tsunamis and inspire many future research activities in this challenging and exciting research field.

Table of Contents:

View text: https://www.mdpi.com/books/pdfview/book/1782

UPCOMING NTHMP & RELATED EVENTS

- January 28-31—NTHMP Winter Meeting (Portland, Oregon) https://nws.weather.gov/nthmp/2020wintermeeting/index.html
- March 19, 2020—CARIBE WAVE 20 Tsunami Exercise https://www.weather.gov/ctwp/
- March 24, 2020—Lantex Tsunami Exercise https://nws.weather.gov/nthmp/tsunamiexercises.html
- March 26, 2020—Pacifex Tsunami Exercise https://nws.weather.gov/nthmp/tsunamiexercises.html
- April 27-30, 2020—SSA Annual Meeting (Albuquerque, New Mexico) https://www.seismosoc.org/annual-meeting/