

NTHMP Winter Meeting Keynote Address by Dr. Dennis Mileti

By Rocky Lopes, NOAA/National Weather Service Tsunami Program

IN THIS ISSUE:	
NTHMP Winter Keynote Address by Dr. Dennis Mileti	1
Winter MMS Meeting Recap	3
NTHMP Annual Meeting Announcement	3
Winter MES Meeting Recap	4
Share Your #SafePlaceSelfie on April 3	4
M7.1 Earthquake Rocks Alaska	5
Remembering Lee Walking—Previous TsuInfo Editor	7
September 28th, 2018 Palu-Sulawesi, Indonesia Tsunami	8
NTHMP Events	8

The NTHMP was delighted to welcome Dr. Dennis Mileti who presented a keynote address during the NTHMP Winter Meeting in San Diego on January 30, 2019. Dr. Mileti is world-renowned Professor of Sociology who has a long legacy of research on human behavior in response to disaster and public warning. He is Professor Emeritus (retired) at the University of Colorado (Boulder) and former Director of the Natural Hazards Research and Applications Center located there. He has published hundreds of articles and books, and has given countless presentations around the world.

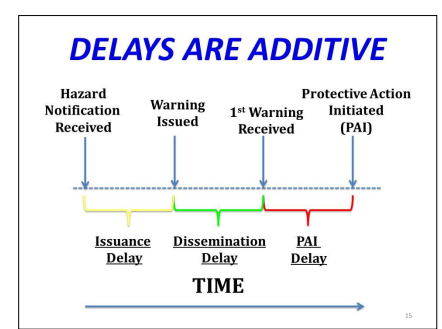
Dr. Mileti's presentation titled *Modernizing Public Warning Messages* informs us that from 65 years of research, with many studies across many events, that repetitive findings equals knowledge. That knowledge is ripe for application because knowledge generalizes across events.



Dr. Mileti reminded us that despite variations in event, threat, protective action, location, and culture, the factors and processes that influence human alert and warning behavior remain pretty much the same. But how people behave in any particular event can vary.

Five actions that will improve and modernize public alerts and warnings in the U.S. include:

- Focus on alerts and warnings for imminent (rapid onset) events, such as tsunamis. When detection to impact time is short, warning delays have large public health and safety consequences.
- Remove delays from the system: a delay is anything that prolongs the time between threat event detection and public protective action initiation. Three types of delay, each of which are additive (see diagram):
 - ◆ Warning *issuance* delay—These delays can be overcome by planning (i.e. prepare warnings in advance and have them ready to go when an event happens).
 - ◆ Audience *dissemination* delay.
 - ◆ Protective action *initiation* delay (sometimes called “compliance”).
- Reduce issuance delays (described above) through planning.



(Continues on page 2)

TsuInfo Alert

Prepared and published bimonthly by the Washington State Department of Natural Resources, Washington Geological Survey, on behalf of the National Tsunami Hazard Mitigation Program (NTHMP), a state/federal partnership led by the National Oceanic and Atmospheric Administration (NOAA).

This publication is free upon request and is available in print by mail and online at:

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

**Assembled and edited by Stephanie Earls,
Librarian, Washington Geological Survey
Washington Dept. of Natural Resources**

1111 Washington St. SE, MS 47007

Olympia, WA 98504-7007

360-902-1473 (p) 360-902-1785 (f)

stephanie.earls@dnr.wa.gov



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.

NTHMP Winter Meeting Keynote Address by Dr. Dennis Mileti

By Rocky Lopes, NOAA/National Weather Service Tsunami Program

(Continued from page 1)

- Disseminate alert and warning messages wisely. Every dissemination channel has pros and cons. Use multiple channels, which yields quicker and more comprehensive audience penetration. Repeat message diffusion multiple times. Sending a message once is not enough.
- Issue messages that reduce public action delay. It is a long-standing myth that people immediately take protective action when they receive a warning. In reality, people who get a warning delay taking protective action and instead waste time by searching the 'net, watching TV, and talking with neighbors trying to decide what, if anything, to do. *This is social milling.*

The optimum public alerts and warnings reduce milling delay and are actionable, specific, clear, and accessible.

The entire presentation was enlightening and reinforced applications that NTHMP partners have used in various ways. New methods for application of these knowledge-based research findings will further assist partners in providing public safety through education, outreach, and mitigation actions to protect life and property.

The full video of Dr. Mileti's keynote address, slide deck, and related content are available on the NTHMP website, Winter Meeting page: <https://nws.weather.gov/nthmp/2019annualmeeting/index.html>

NTHMP NEWS

Summary of the Mapping and Modeling Subcommittee Meetings and Workshops – January 28-29, 2019

By Rick Wilson, California Geological Survey

State members of the Mapping and Modeling Subcommittee (MMS) held a one-day meeting in San Diego, California, on January 28, 2019; Federal members of the MMS could not attend due to the Federal government shutdown. The focus of the MMS meeting centered on projects and tasks identified to be included in its 2019 Annual Workplan. Many of the 2019 tasks are ongoing projects identified as priorities from the 2018 MMS Annual Workplan. These tasks include:

- Developing criteria for tsunami current modeling;
- Updating existing Mapping and Modeling Guidance documents;
- Completing a tsunami source database for NTHMP partner use (lead: California);
- Completing maritime tsunami guidance and a customer-based platform for sharing the guidance (lead: California);
- Holding a future workshop and developing guidance for modeling sediment transport (lead: Washington);
- Finalizing guidance for modeling landslide sources (lead: East Coast);
- Continuing evaluation of meteotsunami modeling and forecasting (lead: Gulf of Mexico)



The MMS also discussed: 1) priorities for digital elevation models to be developed through NOAA's National Center for Environmental Information; and 2) the State of Oregon spearheading future development of guidance for using the tsunami module of the HAZUS risk assessment platform. Jon Allan (Oregon) was also nominated as the new MMS state co-chair. The group thanked Dmitry Nicolsky (Alaska) for his work as the state co-chair over the past four years.

On January 29, 2019, members of the MMS also led and participated in workshops on a wide range of topics, including: 1) the USGS Powell Center tsunami source and probabilistic source characterization project; 2) maritime response and mitigation strategies; 3) sources for two recent (2018) tsunami events in Indonesia; and 4) the NTHMP partner product gap analysis.

ATTENTION — Full NTHMP Annual Meeting August 19 - 23, 2019

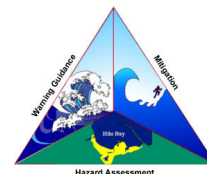
Salt Lake City, Utah

WHAT: Full NTHMP Annual Meeting has been rescheduled for August 19-23, 2019 in Salt Lake City, UT

INCLUDES: All NTHMP Subcommittees, Workshops, General Sessions

ACCOMMODATIONS: Government rate is \$125/night and will fill quickly. Reserve now

REGISTRATION: Open now—<https://nws.weather.gov/nthmp/meetings/2019annualmeeting/>



Mitigation & Education Subcommittee Meeting of January 28, 2019

By Kevin Miller, California Governor's Office of Emergency Services

The National Tsunami Hazard Mitigation Program (NTHMP) Mitigation & Education Subcommittee (MES) meeting was held January 28 in San Diego. This meeting was part of the schedule of "NTHMP Winter Meetings" held through contingency planning, with California already scheduled to host, amidst the Federal government shutdown. As part of the contingency, the originally planned MES meeting was expanded in length and scope.

A dynamic, constructive, and beneficial meeting was assembled among state and territory partners with a number of programmatic and collaborative topics discussed. Discussions included an update on a Social Science Project to evaluate effectiveness of existing maps and brochures, led by the State of Washington. Continuation of NTHMP Maritime Guidance was led by California which covered moving forward on addressing hazard assessment, preparedness and response planning, outreach and education, mitigation and recovery lessons, applications, and examples. The University of Southern California, Southern California Earthquake Center convened a discussion about www.TsunamiZone.org current capabilities, achievements and future planning with states of Alaska, Washington, Oregon, and Hawaii. Alert and warning needs from state/territory perspectives were outlined.



The states of Oregon, Hawaii, Alaska, Washington, California, and territories of America Samoa, United States Virgin Islands, and Puerto Rico each provided project and planning updates which will assist with overall MES planning and coordination during the coming year. The group also began looking at NTHMP subcommittee structure and workload analysis which was informed by a project work group who met over several months and focused on related mitigation and recovery development considerations. Finally large-scale exercise planning and lessons learned from recent storm response and recovery in the Caribbean was provided by the Director of the Puerto Rico Seismic Network.

Share Your #SafePlaceSelfie on April 3

The National Weather Service (NWS) invites contributions to the annual #SelfPlaceSelfie campaign on Wednesday, April 3, 2019, at 11:11 am local time (ET). The purpose of the campaign is for people to demonstrate on social media that they know where to go to be safe during extreme weather and other hazard events (e.g. tsunamis). The NWS also encourages participants to share information about other preparedness activities and engage family members and friends in the campaign. Learn more about #SafePlaceSelfie Day at <https://www.weather.gov/wrn/safeplaceselfie>.



A #SafePlaceSelfie shared by NWS Eureka during the 2017 campaign.

M7.1 Earthquake Rocks Alaska - Tsunami Warning Issued for Cook Inlet

By Kara Gately and Summer Ohlendorf, National Tsunami Warning Center

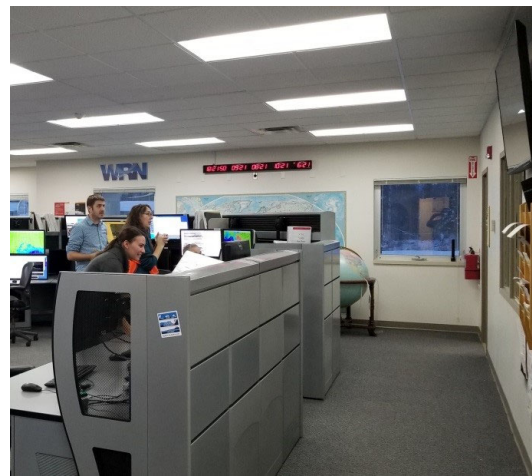
On Friday Nov 30th, a M7.1 earthquake occurred at 08:29 a.m. AKST, 7 miles north of Anchorage, Alaska. The U.S. National Tsunami Warning Center (NTWC) facility, located 30 miles northeast of the earthquake epicenter in Palmer, AK, was first alerted to the event by a loud noise, that resembled heavy machinery quickly approaching – not the typical audible alarm of a seismometer shaking that the team is used to. Staff dropped, covered, and held on as the strong ground shaking began and continued for approximately 70 seconds.

As the shaking began to die down, the power went out and the lights and monitors flickered as the facility's generator came on. Senior Watchstander Kara Gately and Watchstander Summer Ohlendorf calmly, and immediately, responded to the operations area and began assessing the earthquake location and magnitude, as well as NTWC operational data and capabilities. Other staff began checking on the safety of the building, verifying the safety of all employees, and setting up the Communications Center.

Longstanding efforts by NTWC Electronic Technicians and Information Technology staff for operational robustness and earthquake mitigation were put to the test by the intense ground shaking, and NTWC came through with glowing results – as well as enhanced appreciation for this mitigational preparation. The NTWC server room, monitors, data ingest, and communication capabilities were all fully operational. Watchstanders responded to an operations area still at full capacity following a local, M7.1 earthquake. The countertops were covered in dust which had fallen from the ceiling tiles, but only a few monitors were askew.

A preliminary magnitude of $M_{wp}7.0$ was the initial assessment by NTWC barely 4-minutes after origin-time. However, the magnitude grew to $M_{wp}7.2$ as the first message was being issued, upgrading the initial NTWC response procedure from a Tsunami Information Statement to a local Tsunami Warning. As a result, a Tsunami Warning for Cook Inlet and the lower Kenai Peninsula was issued 6 minutes after origin-time. This was done in compliance with “Special Procedures” for interior waterways, for earthquakes in the magnitude range M7.1-M7.5, as discussed in the NOAA Technical Memorandum, NWS AR-45 NOAA/West Coast and Alaska Tsunami Warning Center Pacific Ocean Response Criteria. These special procedures were developed for localized tsunami events, which can occur as a result of ground failures and landslides related to strong ground shaking. Tsunamis generated in these areas are expected to be confined to the source region only.

NTWC was able to put new office improvements to use during event response. The phones were quickly transferred into “event mode” – forwarding all ringing and phone calls (except the unlisted number for Emergency Management) to the Communications Center. This feature resulted in a calmer environment in the operations area for the scientists working the event while ensuring that all essential calls still got through. Another improvement was in the updated staff recall system. NTWC personnel were efficiently recalled 10 minutes after origin-time using the new Twilio system, with the recall notice being received by all in less than a minute.



NTWC staff share information and coordinate event response during the Tsunami Warning, Nov 30th, 2018. Photo Credit: Michael Burgy, NTWC.

(Continues on page 6)

M7.1 Earthquake Rocks Alaska - Tsunami Warning Issued for Cook Inlet

By Kara Gately and Summer Ohlendorf, National Tsunami Warning Center

(Continued from page 5)

Almost all NTWC personnel responded to assist within 10-20 minutes of getting the notification. NWS Alaska Regional HQ and Anchorage WFO had to evacuate their buildings and cell phone towers were overloaded, which made contact with the Alaska Region ROC difficult. Communication with the NTWC Acting Director, Don Moore and NWS National HQ was established within 8 minutes of issuing the tsunami warning. As staff members arrived at NTWC, they were assigned various roles and responsibilities: to gather updated seismic information, monitor sea levels, provide impact-decision support, and handle internal and external communications.

A fixed warning for Cook Inlet is an unusual tsunami warning with an atypical region in alert - interior waterways and the highly populated city of Anchorage, Alaska. Hence, the decision was made to hold a conference call with core partners very early in the event to clarify the threat, the concerns, the expectations, and the extent of the warning. Specifically, that this was a local event that was not going to expand and there was no concern of tsunami danger for residents outside the alerted area. This first conference call was held at 09:00 a.m. AKST. Just before the call, contact with the USGS National Earthquake Information Center (NEIC) revealed that they had a normal faulting mechanism and a magnitude of $M_{ww}7.0$ for the event.

Protocol is to hold initial tsunami alert until it can be confirmed there is no danger. NTWC monitored tide gauges in the immediate area and held the alert until the coastal hazard from all potential sources could be dismissed. While Anchorage, Alaska is not considered at risk from a tsunami generated in, and propagating from, the deep ocean, the nearby coastal hazard related to ground failures needed to be considered. Though the shallow waters of Cook Inlet do not have the same destructive potential for tsunami generation as the deep ocean, there was potential for coastal and/or underwater ground failures, which could result in a local tsunami-like hazard. Potential sources related to ground failures from intense shaking near the earthquake epicenter included: underwater slumping or submarine landslides in Cook Inlet, liquefaction and coastal ground failure, and aerial landslides or rock falls along Turnagain Arm. However, it is also noted that Cook Inlet is shallow, Anchorage is surrounded by mud-flats, and the tide was out – all factors which mitigated the coastal hazard for Anchorage proper.

NTWC ran the RIFT (“Real-time Inundation Forecasting for Tsunamis”) model, using the latest faulting mechanism from USGS. The forecast showed that any waves associated with deformation from the earthquake would be minor, and below warning thresholds. This confirmed the working assumption, that there was very little deformation of the surface associated with the earthquake slip itself, so any tsunami danger would likely come from secondary sources such as slides.

The upper Cook Inlet is home to large river deltas and alluvial fans of silt, which are prone to failure. NTWC assessed the ShakeMap and Ground Failure predictions put out by USGS and the Alaska Earthquake Center. The ShakeMap was helpful in determining the rupture area was largely to the north of the epicenter, and not underneath Cook Inlet. This helped to alleviate some concerns for underwater slumping. The Liquefaction Map was useful for pinpointing areas of coastal concern, and detailing the low-lying wet soils from Point MacKenzie, west to the Susitna River. However, Landslide Maps provided by USGS do not take into account bathymetry, and the underwater hazard is not accounted for.

(Continues on page 7)

M7.1 Earthquake Rocks Alaska - Tsunami Warning Issued for Cook Inlet

By Kara Gately and Summer Ohlendorf, National Tsunami Warning Center

(Continued from page 6)

NTWC monitored three tide gauges in Cook Inlet, (Anchorage, Nikiski, and Seldovia) and remained alert to any reports of unusual water activity. Knowing exactly how long one had to wait before determining enough time had passed, from all potential sources to all available tide gauges, was something that had to be estimated on the fly. NTWC was able to monitor the danger, or lack of, for Anchorage proper through the Anchorage tide gauge as well as through news, social media, and direct reports from the local populous. However, large portions of uninhabited coastline in upper Cook Inlet, along with slow tsunami travel times for the shallow water, required due process before determining an “all clear.” In the second and final conference call held by NTWC, all core partners were asked if there had been any reports of coastal waves or unusual water activity from their constituents, before cancelling the tsunami warning, 90 minutes after origin-time.

Overall, NTWC considers this a successful event and notes that many of the small changes incorporated since the January 2018 Kodiak event contributed to a calmer, more efficient and coordinated event-response. One unique and new aspect of this event worth highlighting was the efficient and effective use of social media by NTWC staff – even after the tsunami warning was cancelled. Many post-earthquake social media posts providing supplemental information with facts about earthquake predictions and normal aftershock behavior helped to inform the public, were well received, and were shared widely. We thank all of our partners for their cooperation and feedback.

Remembering Lee Walking - Previous Editor of TsuInfo Alert

By Alice Coakley, Stephanie Earls, and Tim Walsh

Lee Walking, longtime editor of TsuInfo Alert, passed away on January 31, 2019. She was born April 13, 1946 in Pasadena, California. At eight, her family moved to Centralia, Washington. Upon graduating from Centralia High School in 1964, she returned to California to attend Pasadena City College and UCLA, where she earned an undergraduate degree in Motion Picture Production and a graduate degree in Library Science. She began her library career at the Los Angeles County Public Library. After five years, she got a job in Hollywood as a script supervisor. In the late 1990s, she returned to Washington State where she began work as a librarian at the Washington Geology Library, serving the staff of the Division of Geology and Earth Resources (now called the Washington Geological Survey) and the public.

The highlight of her time at the Washington Geology Library involved being editor of the TsuInfo Alert newsletter. She greatly enjoyed combing the current tsunami news and research for relevant material to include in each issue. After 15 years as a geology librarian and TsuInfo editor, she retired in 2013. Sadly, the signs of rapidly progressive dementia appeared around 2016, and she died from complications of the disease. She will be missed.

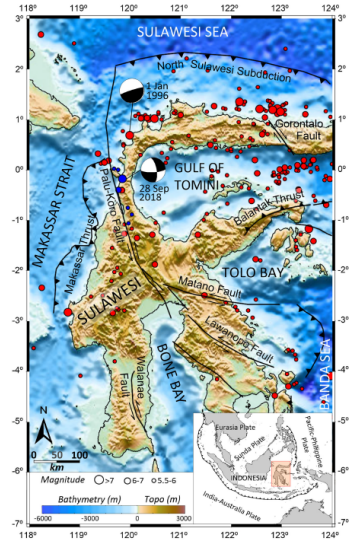


TSUNAMI RESEARCH & NTHMP EVENTS

The September 28th, 2018, Tsunami In Palu-Sulawesi, Indonesia: A Post-Event Field Survey

By R. Omira, G. G. Dogan, R. Hidayat, S. Husrin, G. Prasetya, A. Annunziato, C. Proietti, P. Probst, M. A. Paparo, M. Wronna, A. Zaytsev, P. Pronin, A. Giniyatullin, P. S. Putra, D. Hartanto, G. Ginanjar, W. Kongko, E. Pelinovsky, and A. C. Yalciner

ABSTRACT: On September 28th, 2018, a powerful earthquake (Mw 7.5) struck the Island of Sulawesi in Indonesia. The earthquake was followed by a destructive and deadly tsunami that hit the Bay of Palu. A UNESCO international tsunami survey team responded to the disaster and surveyed 125 km of coastline along the Palu Bay up to the earthquake epicentre region. The team performed 78 tsunami runup and inundation height measurements throughout the surveyed coastline. Measured values reached 9.1 m for the runup height and 8.7 m for the inundation height, both at Benteng village. The survey team also identified ten large coastal sectors that collapsed into the sea of Palu Bay after the earthquake. The distribution of the measured tsunami data within Palu Bay exhibits a clear localised impact suggesting the contribution of secondary non-seismic local sources to the generation of the tsunami. Findings of the field reconnaissance are discussed to provide an insight into the remaining debated source of the Palu tsunami.



CITATION: Omira, R.; Dogan, G. G.; Hidayat, R.; Husrin, S.; Prasetya, G.; Annunziato, A.; Proietti, C.; Probst, P.; Paparo, M. A.; Wronna, M.; Zaytsev, A.; Pronin, P.; Giniyatullin, A.; Putra, P. S.; Hartanto, D.; Ginanjar, G.; Kongko, W.; Pelinovsky, E.; Yalciner, A. C., 2019, The September 28th, 2018, Tsunami In Palu-Sulawesi, Indonesia: A Post-Event Field Survey: Pure and Applied Geophysics, <https://doi.org/10.1007/s00024-019-02145-z>, 17 p.

UPCOMING NTHMP & RELATED EVENTS

- ◆ April 23–26, 2019—Seismological Society of America (SSA) Annual Meeting (Seattle, Washington) <https://www.seismosoc.org/>
- ◆ June 16–21, 2019—8th Tsunami and Safety Symposium ISOPE-2019 (Honolulu, Hawaii) <https://goo.gl/pA972R>
- ◆ July 8–18, 2019—IUGG 27th General Assembly (With Joint Tsunami Symposium) (Montreal, Canada) <http://iugg2019montreal.com/>
- ◆ August 19–August 23, 2019—NTHMP Annual Meeting (Salt Lake City, Utah) <https://nws.weather.gov/nthmp/>
- ◆ September 16–20, 2019—OceanOBS'19 (Honolulu, Hawaii) <http://www.oceanobs19.net/>

