

NOAA Tsunami Program

Working with partners to turn science into action, policy, warning, and risk reduction

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We are here

NOAA “Tsuniverse”

U.S. Department of Commerce

Science Advisory Board: Tsunami Science and Technology Advisory Panel

National Oceanic and Atmospheric Administration (NOAA)

Post-Tsunami Event Response

Ocean Service

National Weather Service (NWS)

Fisheries

Satellites and Information

Research

Office of Marine and Aviation Operations (OMAO)

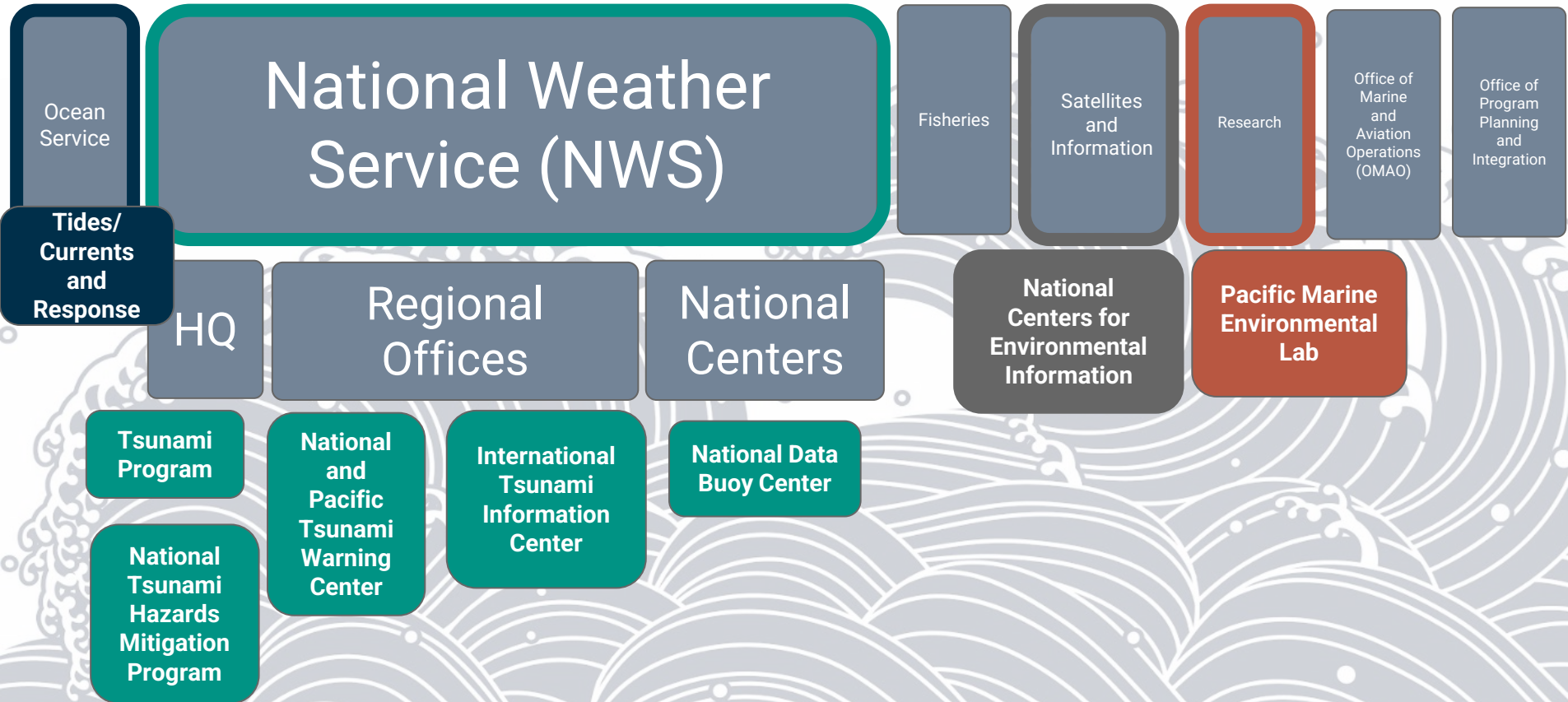
Office of Program Planning and Integration

HQ

Regional Offices

National Centers

NOAA's Tsuniverse



Tsunami is a Priority at NWS

Priorities & Action Strategies for the Future - “Ken’s 10”



Short-Term/Quick Wins

Slack/NWSChat Conversion



Radar Lite and Radar GIS – Access and Speed



PMO/Evolve Next Steps and Governance Update



Medium-Term

Tsunami Program



Weather.gov



AWIPS in the Cloud



Long-Term/Strategic

Staffing Requirements & Ops Model



NWS IT Architecture & IT Governance



DEIA: Recruitment & Retention



Probabilistic Forecasting/Hazard Services



Watchlist

Underway and Well in Hand

Shift Flexibility Team



DEIA Tiger Team Task Force



Emerging

Next Generation Radar



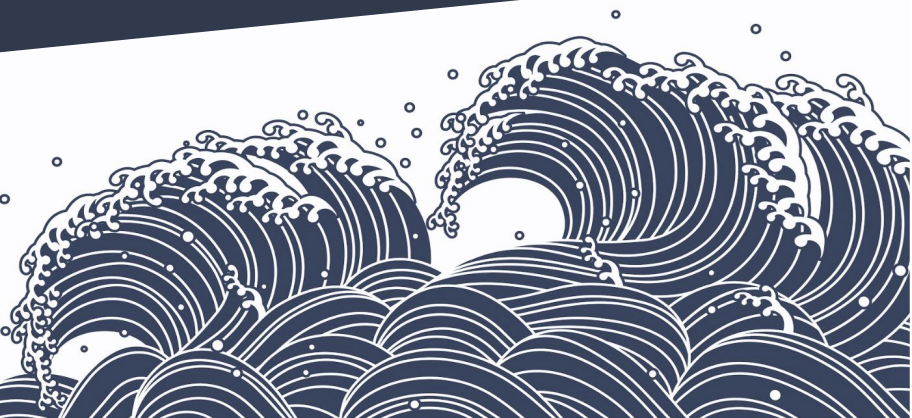
Tsunami Warning Center (TWC) Operations Alignment

- NWS is actively working on improving operational backup capabilities between the TWCs
- Align tsunami operations event analysis, processes and procedures
- The technology alignment is at the forefront but future changes to their systems is expected to lead to service and messaging changes from the TWCs.



Tsunami Program Works in progress

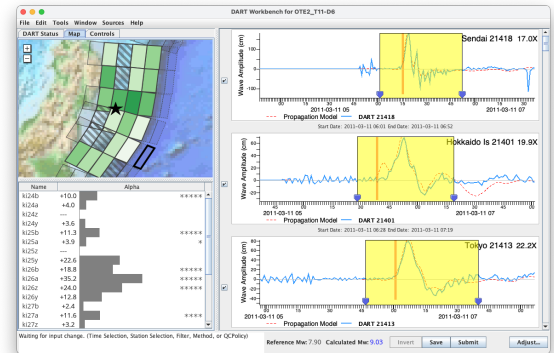
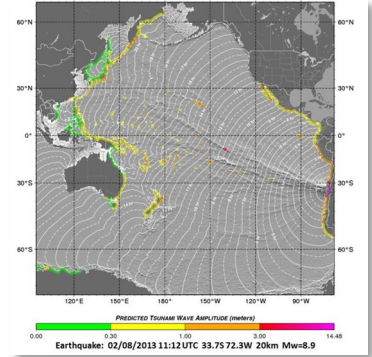
- Redesigning the Tsunami.gov website
- Conducting a social science study on alert terminology and Hazard Simplification (considering removing or altering the Advisory-level alert term)
- Developing a Common Analytic System (CAS) for tsunami detection, forecasting, and alerting
- Developing the Automated Weather Information Processing Service (AWIPS) for Tsunami Operations Messaging Service (ATOMS)
- Developing a vision and plan for Impact - based Decision Support Services (IDSS)
- Staff alignment, training, and exercising



Common Analytic System (CAS)

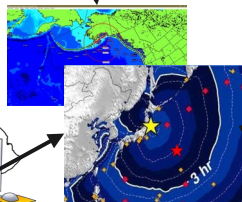
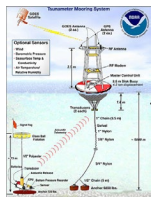
CAS will provide comprehensive and consistent ingest and processing of observational data, forecast development, and alerting guidance in support of redundant TWC operations.

- Seismic analysis / Threat assessment: common tools and analysis of seismic data
- Data Ingest/ Sea-level data synchronization
- End-to-end Forecast Prototype
 - Create a simplified interface to run models from seismic results
 - Show model/water-level comparisons
 - Push model results to ATOMS for dissemination



ATOMS the Tsunami Operations Messaging Service

Seismic and water level Information



Unified Tsunami Forecast System Output

TWC Backup

AWIPS Tsunami Operations Messaging System (ATOMS)

The ability to view tsunamigenic events

A Physical Event Manager (PEM)
For tracking and managing large-scale phenomenon

Threat Area Recommendations

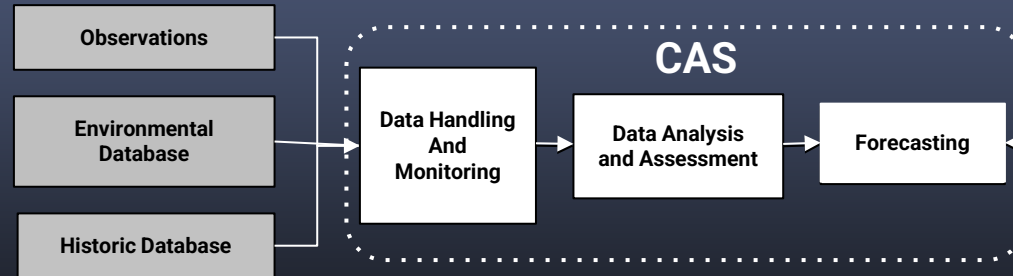
Hazard Services Recommender Framework
For rapid creation of Hazard Events

Produce Multiple Product Messages

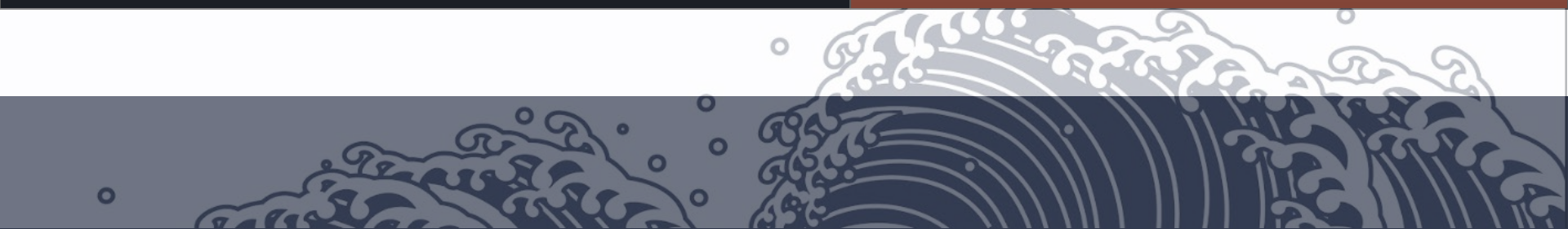
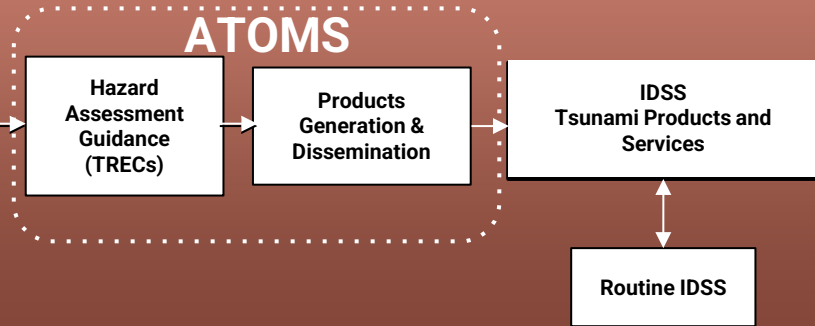
Hazard Services Product Generation and Formatting Framework
For management of messages being issued to the public

Simplified Version of the Future Tsunami Forecasting and Alerting Process

Applied Tsunami Science and Technology

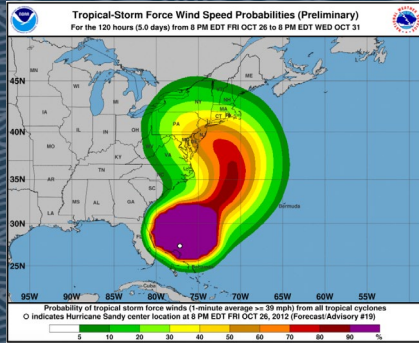


Tsunami Service Coordination and Partner Engagement



Future of the NOAA Tsuniverse

What are the chances?



What would it take to do:

- Probabilistic Forecasting
- PTHA: Probabilistic Tsunami Hazard Analysis
- Graphical alert products
- Improved source and tsunami detection

Impact Based Decision Support Services



- What do partners and decision makers need?
- What are we providing that works?
- What else should we be providing?
- How do we get there?

Tsunami Warning Center Alignment



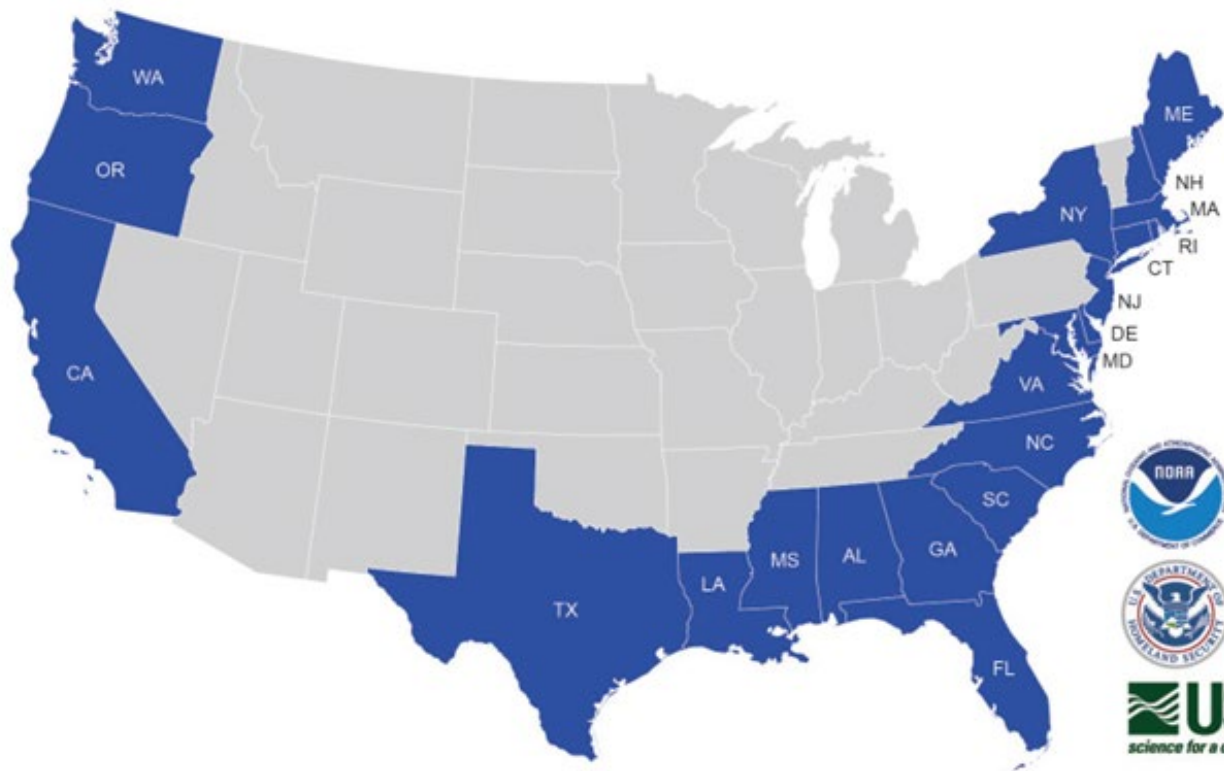
- Science and technology integration
- Unified alerting procedures and technology
- Organizational support
- Upgraded services and systems
- Training and exercises

National Tsunami Hazard Mitigation Program (NTHMP)

A NOAA-funded grant program that annually provides state and territory partners with funding to address science, education, mitigation, & warning strategies to improve service & safety to all US coastal communities, with cooperation from interagency stakeholders, such as FEMA and the USGS.



National Tsunami Hazard Mitigation Program Partners



FEMA



NTHMP: Science into Action

The NTHMP has four strategic overarching priorities, or themes:

1. Hazard and Risk Assessment
2. Education and Preparedness
3. Mitigation and Recovery
4. Alert, Warning, and Response

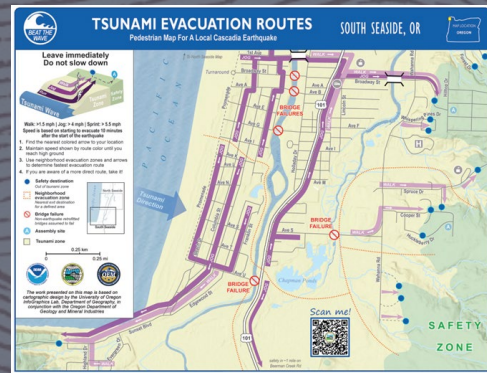


United States National Tsunami Hazard Mitigation Program Strategic Plan for 2024 - 2029



NTHMP Hazard and Risk Assessment

Theme	Goals	Strategies
<p>Hazard And Risk Assessment</p>	<p>Tsunami hazard assessments identify areas where risk-reduction planning is needed</p> <hr/> <p>Methods to characterize and communicate societal risks to tsunamis are developed and properly applied to support risk-reduction planning</p>	<ul style="list-style-type: none"> Identify and address gaps in tsunami source characterization and modeling Complete inundation and evacuation maps for all U.S. coastal communities Identify and address product requirements that support the maritime industry <hr/> <ul style="list-style-type: none"> Assess population exposure, vulnerability, and evacuation potential to tsunami Support the development and appropriate use of tsunami loss-estimation methods and tools, such as Hazus and the National Risk Index



NTHMP Education and Preparedness

Tsunami Education and Preparedness	<p>At-risk populations are informed and prepared to respond appropriately to tsunamis</p>	<ul style="list-style-type: none"> • Engage public and private schools and institutions of higher learning • Develop, update, and disseminate consistent outreach materials • Conduct training and outreach events and campaigns • Evaluate tsunami outreach and incorporate findings into future efforts
	<p>New TsunamiReady® sites are established and existing sites are maintained</p>	<ul style="list-style-type: none"> • Recognize TsunamiReady® Communities • Increase number of recognized TsunamiReady® Tier 2 Communities • Increase number of designated TsunamiReady® Supporters • Determine and promote best practices for tsunami risk-reduction • Evaluate TsunamiReady® criteria and re-establish TsunamiReady® boards
	<p>Engage and support local efforts to improve tsunami preparedness</p>	<ul style="list-style-type: none"> • Conduct exercises that include tsunami scenarios to improve future response • Promote effective planning for tsunami preparedness



NTHMP Mitigation and Recovery

Mitigation and Recovery

Mitigation and recovery strategies are developed for long-term community planning

- Develop guidelines and model practices for mitigation and recovery
- Develop resources and model practices for mitigation and recovery funding
- Support improvements to FEMA's National Risk Index and RiskMAP
- Help building code developers incorporate best available science
- Incorporate non-seismic sources and long-term impacts of climate change on coastal communities into tsunami mitigation and recovery planning

Mitigation and recovery strategies are initiated and incorporated into long-term community planning

- Implement guidelines and model practices for mitigation and recovery
- Increase local stakeholder capacity for mitigation and recovery efforts



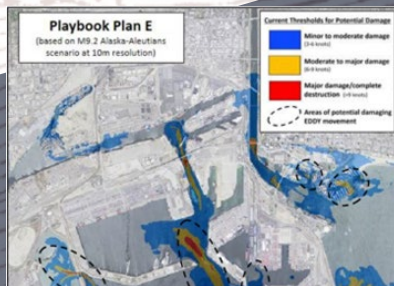
W
UNIVERSITY of
WASHINGTON



PROJECT SAFE HAVEN: TSUNAMI
VERTICAL EVACUATION ON THE
WASHINGTON COAST

NTHMP Alert, Warning, and Response

Alert, Warning, and Response	Tsunami Warning Center products are understandable, effective, and actionable	<ul style="list-style-type: none"> • Provide guidance to refine Tsunami Warning Center and state-level products • Provide stakeholder requirements through the WCS • Improve availability of products for underserved and vulnerable communities • Support the National Weather Service Hazard Simplification Project
	Warning forecast dissemination is effective and reliable	<ul style="list-style-type: none"> • Coordinate periodic system-wide communication tests and encourage authorities to participate and provide feedback • Dedicate outreach and exercise efforts for underrepresented communities • Improve local warning reception capabilities • Improve local warning dissemination capabilities
	Tsunami response is effective	<ul style="list-style-type: none"> • Support and provide tools to enhance community-level response planning • Align NTHMP partner alerting and response • Collaborate with USGS on testing and consistent messaging of ShakeAlert earthquake messaging and tsunami alerting
	Field data collection and communication efforts are coordinated after a tsunami	<ul style="list-style-type: none"> • Support and implement post-tsunami event protocols • Exercise field data collection efforts locally, regionally, and nationally



WEPA41 PAAQ 110851
TSUWCA

BULLETIN
TSUNAMI MESSAGE NUMBER 4
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
1251 AM PST FRI MAR 11 2011

THE WARNING AND ADVISORY STATUS REGIONS HAVE CHANGED IN THIS MESSAGE.

...THE TSUNAMI WARNING CONTINUES IN EFFECT FOR THE COASTAL AREAS OF CALIFORNIA AND OREGON FROM POINT CONCEPCION CALIFORNIA TO THE OREGON-WASHINGTON BORDER...

Examples of some new NTHMP activities

Turning Science into Risk Reduction

U.S. Virgin Islands (USVI) social science study key findings:

1. Varied levels of tsunami risk awareness across different age groups and communities
2. Gaps in understanding of proper evacuation procedures and safe zones
3. The effectiveness of current outreach and education programs
4. Preferred methods for receiving tsunami warnings and preparedness information



A community leader painting a tsunami evacuation sign on a street in Aguadilla, PR.

Tsunami Maritime Response and Mitigation Strategy:
Makah Tribe's Port of Neah Bay
Neah Bay, Washington



2024



Guam: Tsunami Commercial



GHS/OCD Tsunami Preparedness Commercial

Examples of some new NTHMP activities

Turning Science into Risk Reduction

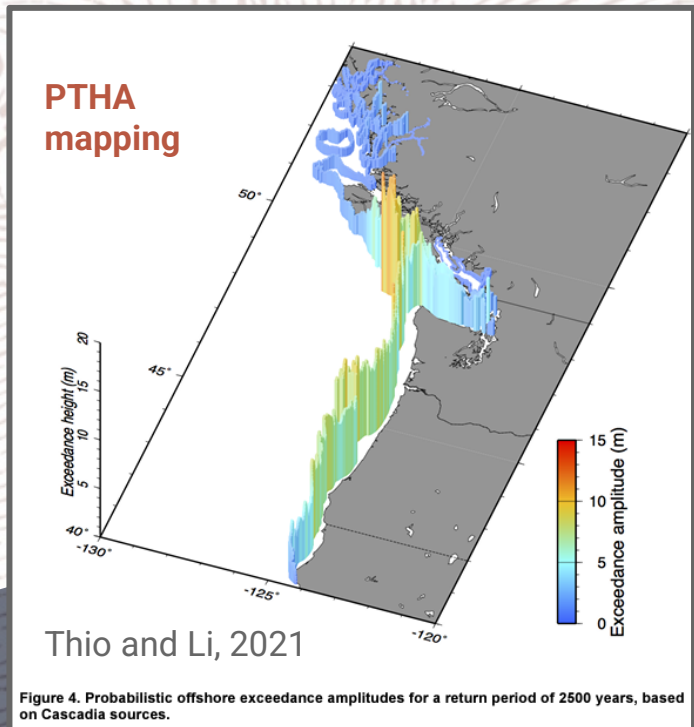
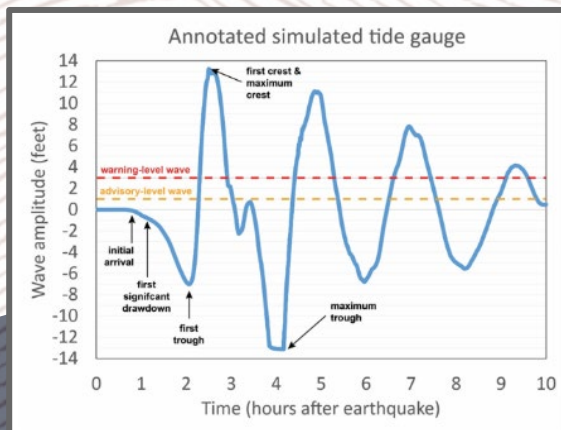


Figure 4. Probabilistic offshore exceedance amplitudes for a return period of 2500 years, based on Cascadia sources.



Tiger Team to study Tsunami Wave Arrival.
What does wave arrival mean to decision makers and are we all using it the same way?

TSUNAMI RISK ASSESSMENT SAN LUIS OBISPO COUNTY

TSUNAMI SCENARIO: The California Tsunami Program is using FEMA's Hazus building inventory database that leverages the U.S. Army Corps of Engineers National Structure Inventory 2022. These building inventory data are used, along with the State's probabilistic tsunami hazard analysis data with a 97.5-year average return period, to perform Hazus loss and casualty analysis. Building loss and casualty estimates are then paired with demographic data to assess risk and exposure at the county level.

BUILDING INVENTORY Hazus 2023

Approximate Total Building Related Loss: **856** million of dollars

Building Exposure Ratio: **2%** (damaged buildings / total county buildings)

Building Damage Count

Total Damaged Buildings 2,470	40% Affected (green tag)	30.9% Minor (green tag)	8.9% Major (yellow tag)	20.2% Destroyed (red tag)
	987	763	220	500

Loss estimates include costs for repair and replacement of damaged buildings and costs associated with loss of function. The Hazus Tsunami Model does not include estimates for damage and losses for structures associated with ports, harbors, or other maritime related facilities; or damage to infrastructure, roads, and essential facilities.

CASUALTY ESTIMATIONS Hazus 2023

Distant-Source Casualty Estimations 285-minute Tsunami Travel Time (Worst Case Tsunami Source for County)

Daytime Total Casualty Estimates			Nighttime Total Casualty Estimates		
Evacuation Departure Delay Time (milling time)*	15-min	30-min	Evacuation Departure Delay Time (milling time)*	15-min	30-min
0	79	0	0	66	0

* Assumes 60 minutes after earthquake before evacuation warning (official warning) is provided to community.

Casualties were estimated using Hazus integrated methods based on the USGS Pedestrian Evacuation Analyst Tool, which evaluates evacuation travel times using only roads as travel pathways for evacuation. Three different evacuation departure delay times were used to model the variation in evacuation response of the population.

AT RISK DEMOGRAPHICS ESRI 2023

AT RISK POPULATION	LANGUAGE & POVERTY
673 Households With Disability	8 Pop 65+ Speak Spanish & no English
1,597 Population 65+	282 Households Below the Poverty Level
POPULATION AND BUSINESSES	
8,965 Daytime Population	2,729 Households
5,230 Total Employees	701 Total Businesses

DISCLAIMER: This information is presented to assist cities, counties, and tribal areas understand their risk and exposure to tsunamis. This data is not intended for real estate transactions nor for any other land-use or regulatory purpose.



Want to get involved?

- NOAA and the NTHMP rely on you (SMEs) to help us learn about and use the most up to date science, technology, and policy
- Communication and collaboration will help us all
- Coordinating grant/funding opportunities is critical (NASA, NSF, NEHRP, NOAA, SeaGrant, NIST, etc.)





Let's
Discuss