NOAA Tsunami Program

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

Corina Allen
NOAA Tsunami Program Manager
corina.allen@noaa.gov

Image credit: NASA

NOAA “Tsuniverse”

Image credit: NASA

U.S. Department of Commerce

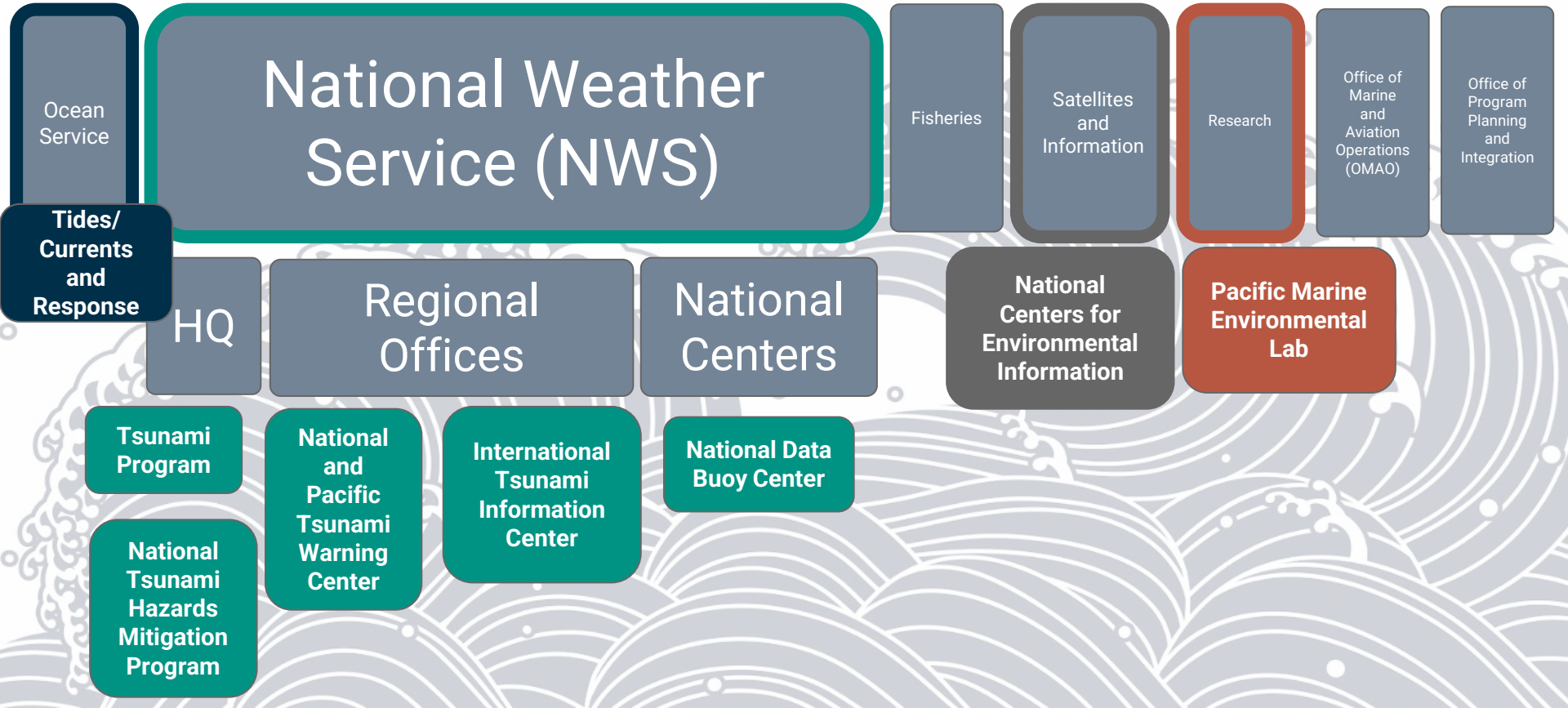
National Oceanic and Atmospheric Administration (NOAA)

Science Advisory Board: Tsunami Science and Technology Advisory Panel

Post-Tsunami Event Response

- Ocean Service
- National Weather Service (NWS)
  - HQ
  - Regional Offices
  - National Centers
- Fisheries
- Satellites and Information
- Research
- Office of Marine and Aviation Operations (OMAO)
- Office of Program Planning and Integration

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

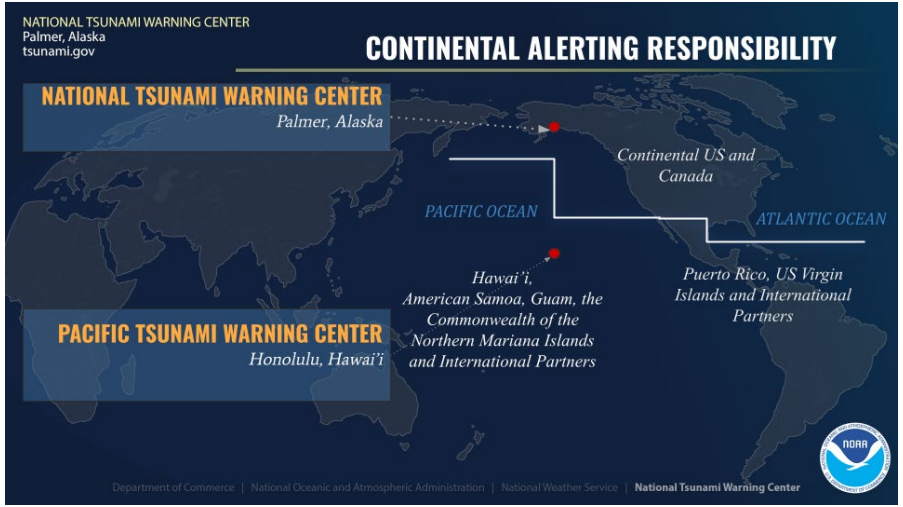
- Shift Flexibility Team
- DEIA Tiger Team Task Force

Emerging

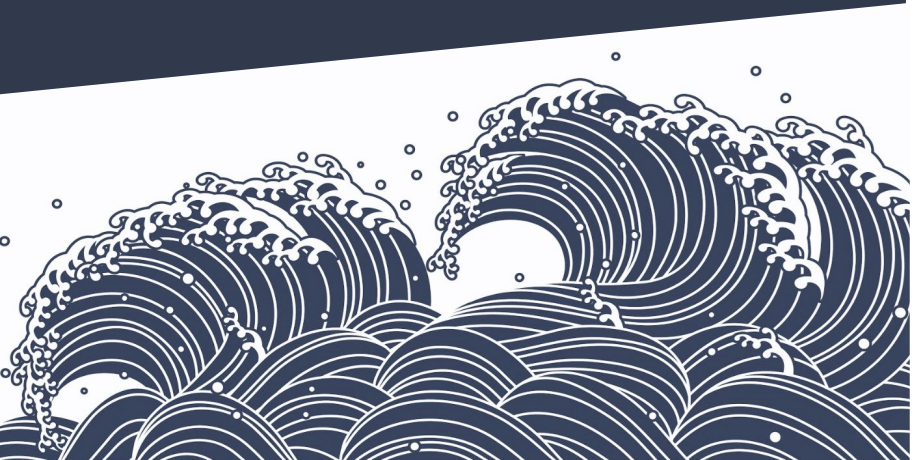
- Next Generation Radar

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.



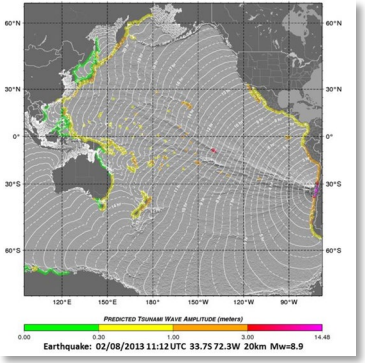
Tsunami Program Works in progress



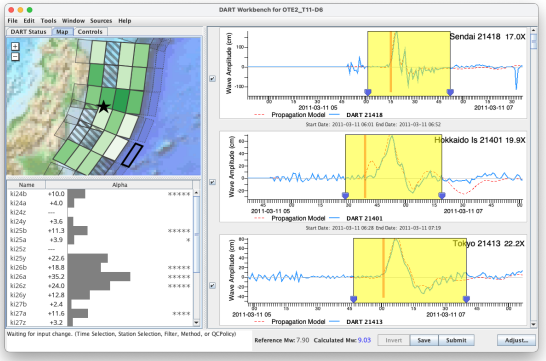
- Redesigning the Tsunami.gov website
- Conducting a social science study on alert terminology and Hazard Simplification (considering removing or altering the Advisory-level alert term)
- Developing a Common Analytic System (CAS) for tsunami detection, forecasting, and alerting
- Developing the Automated 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.

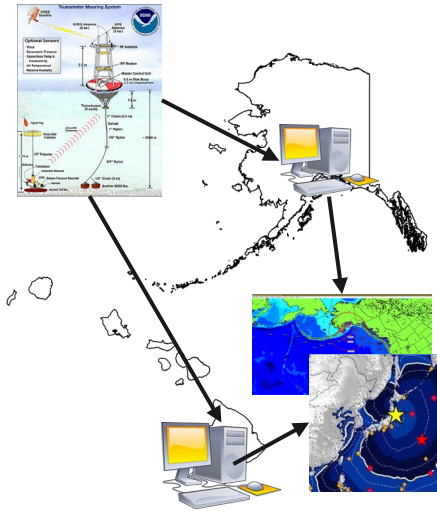


- **Seismic analysis / Threat assessment: common tools and analysis of seismic data**
- **Data Ingest/ Sea-level data synchronization**
- **End-to-end Forecast Prototype**
  - **Create a simplified interface to run models from seismic results**
  - **Show model/water-level comparisons**
  - **Push model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

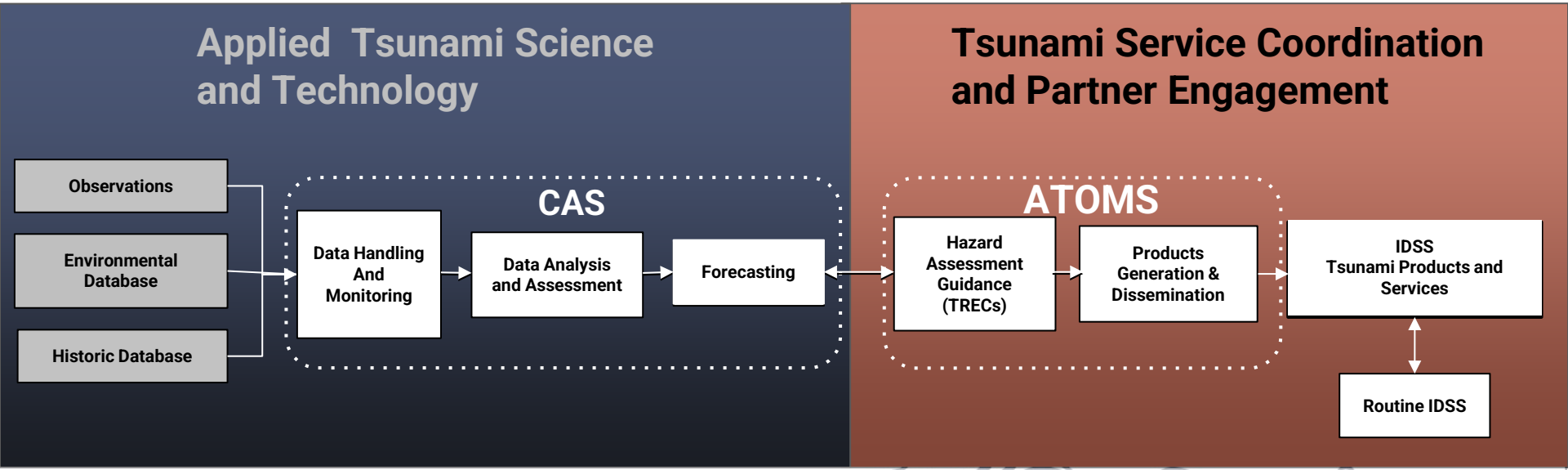
Threat Area Recommendations

Hazard Services Recommender Framework
For rapid creation of Hazard Events

Produce Multiple Product Messages

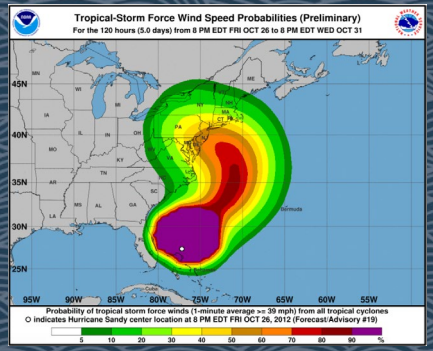
Hazard Services Product Generation and Formatting Framework
For management of messages being issued to the public

Simplified Version of the Future Tsunami Forecasting and Alerting Process



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

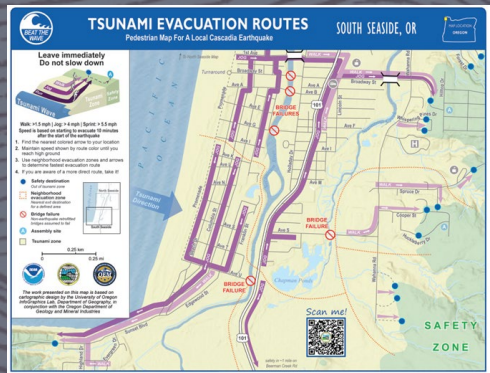
NTHMP: Science into Action

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

NTHMP Hazard and Risk Assessment

Theme	Goals	Strategies
Hazard And Risk Assessment	Tsunami hazard assessments identify areas where risk-reduction planning is needed	• 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
	Methods to characterize and communicate societal risks to tsunamis are developed and properly applied to support risk-reduction planning	• 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

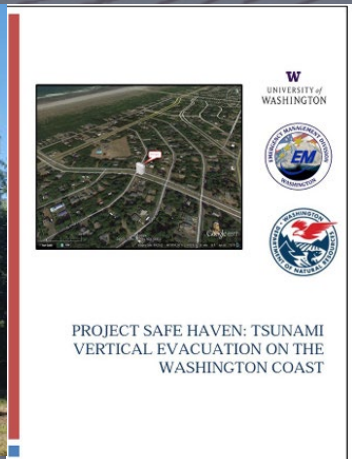


NTHMP Education and Preparedness

Tsunami Education and Preparedness	At-risk populations are informed and prepared to respond appropriately to tsunamis	• 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
	New TsunamiReady® sites are established and existing sites are maintained	• 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
	Engage and support local efforts to improve tsunami preparedness	• Conduct exercises that include tsunami scenarios to improve future response • Promote effective planning for tsunami preparedness

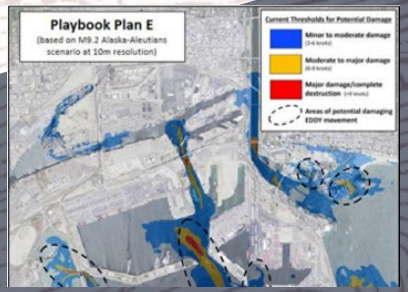
NTHMP Mitigation and Recovery

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



NTHMP Alert, Warning, and Response

Alert, Warning, and Response	Tsunami Warning Center products are understandable, effective, and actionable	• 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	• 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	• 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	• 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:

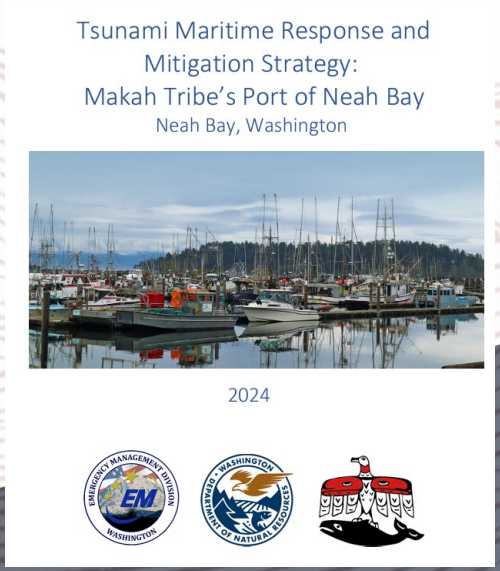
1. Varied levels of tsunami risk awareness across different age groups and communities

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.

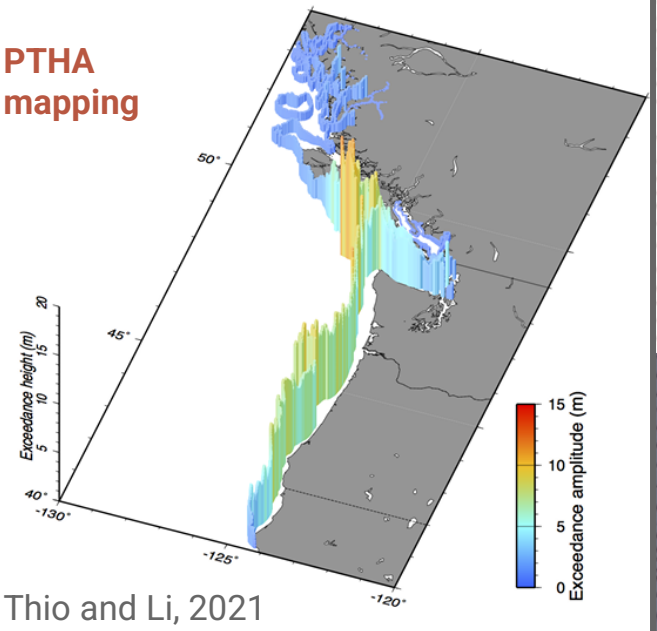


GHS/OCD Tsunami Preparedness Commercial

Examples of some new NTHMP activities

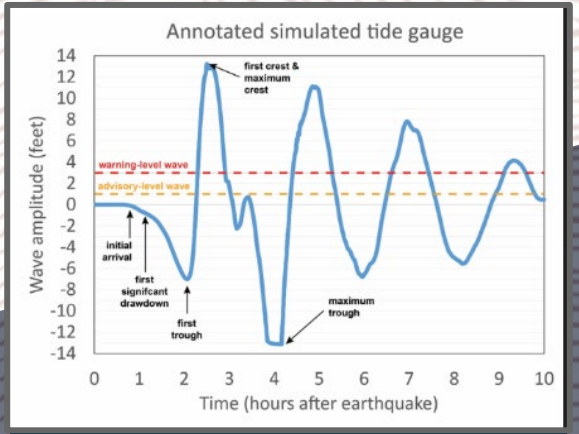
Turning Science into Risk Reduction

PTHA mapping



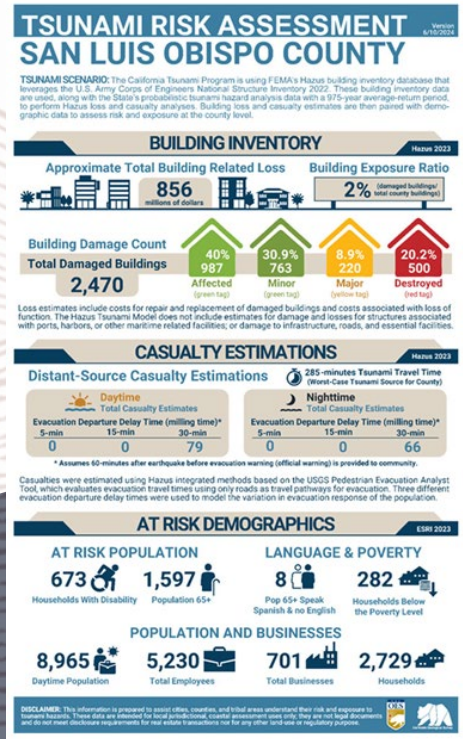
Thio and Li, 2021

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?



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