UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-TEWS Hawaii)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
15-26 September 2025, Honolulu, Hawaii

Preparedness for Maritime Community
Tsunami Planning for Ports and Harbours
USA Examples

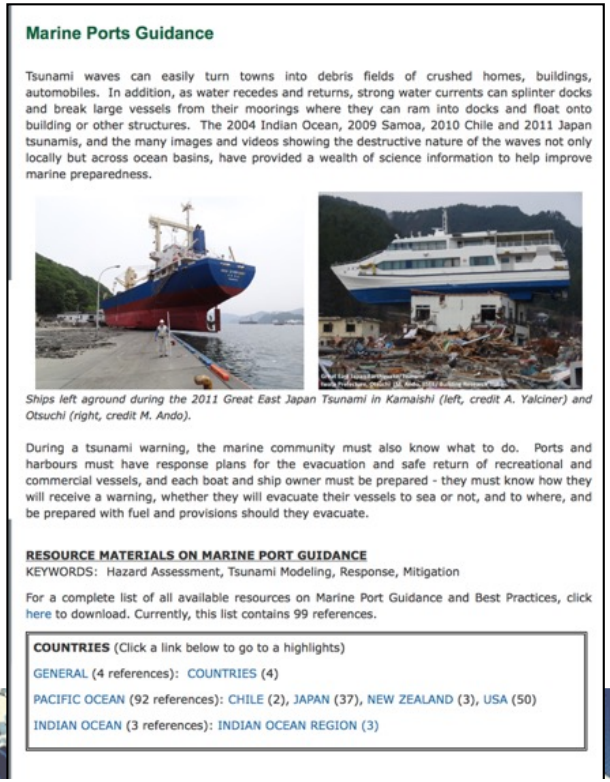
Dr. Laura Kong
Director, ITIC

Best Practices – Compilations - International

- PTWS and TOWS actions
- Request Member States to share guidance, building codes, examples
- **Vertical Evacuation**
  117 refs from Pacific, IO, NEAMTWS

  https://www.weather.gov/itic-car/vertical_evacucation_guidance
- **Marine Preparedness – Ports and Harbors**
  100 refs from Pacific, IO

  https://www.weather.gov/itic-car/marine_ports_guidance

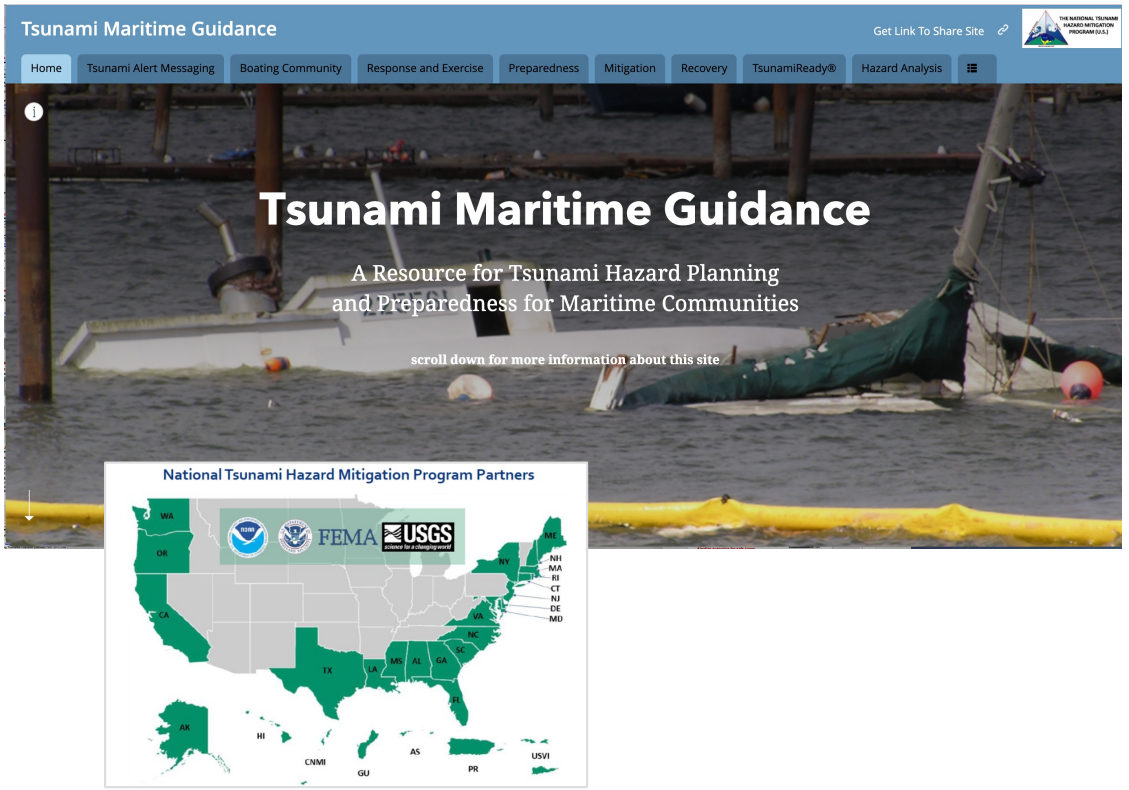


Best Practices – Compilations - USA

- **Tsunami Maritime Guidance**

  https://arcg.is/0DeHrG

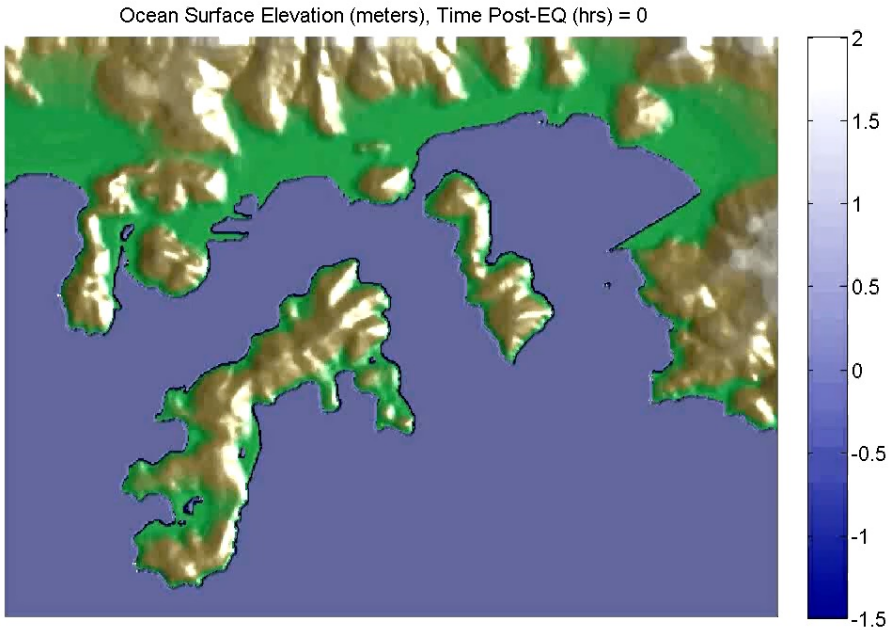
- US National Tsunami Hazard Mitigation Program
- Resources for life-safety and damage-reduction mitigation measures - implement before, during, and after tsunami to reduce risk, improve resilience, and facilitate recovery
- Living document

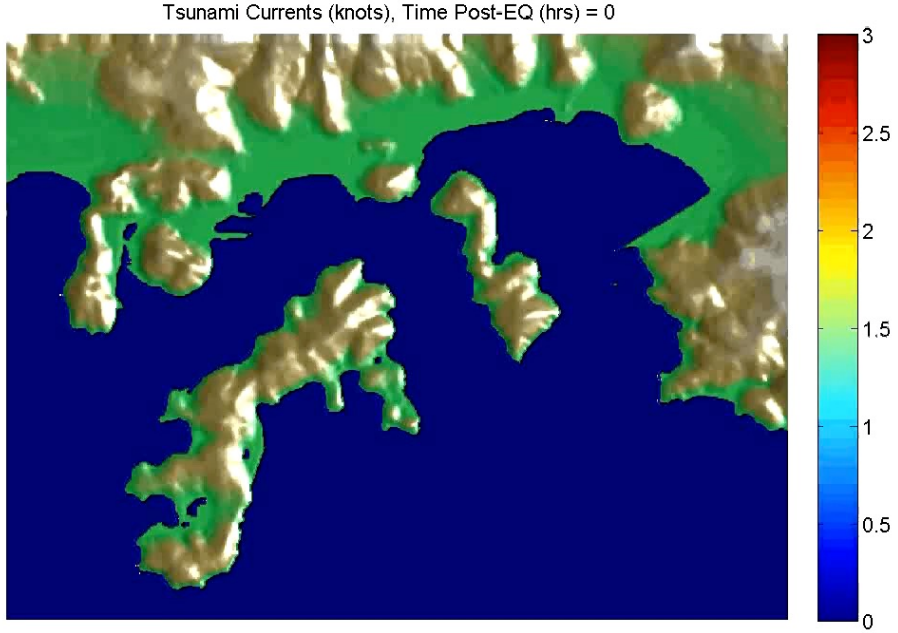


Marine Preparedness - Tourism and Cruise Ships

18 Nov 1867
M7.5
24 deaths
USVI:
4.9-15.2m

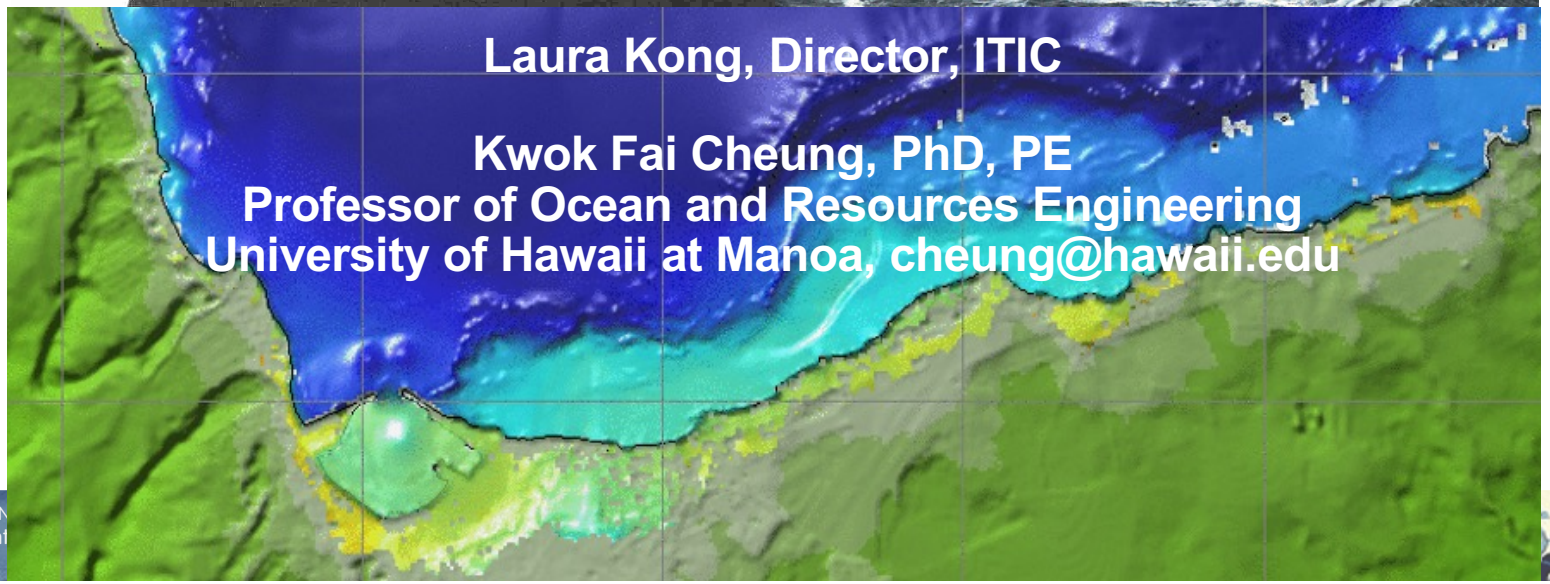
M9, Northern Puerto Rico Trench





P. Lynett, USC

Tsunami Safety Products for Hawaii and Guam



Laura Kong, Director, ITIC

Kwok Fai Cheung, PhD, PE
Professor of Ocean and Resources Engineering
University of Hawaii at Manoa, cheung@hawaii.edu

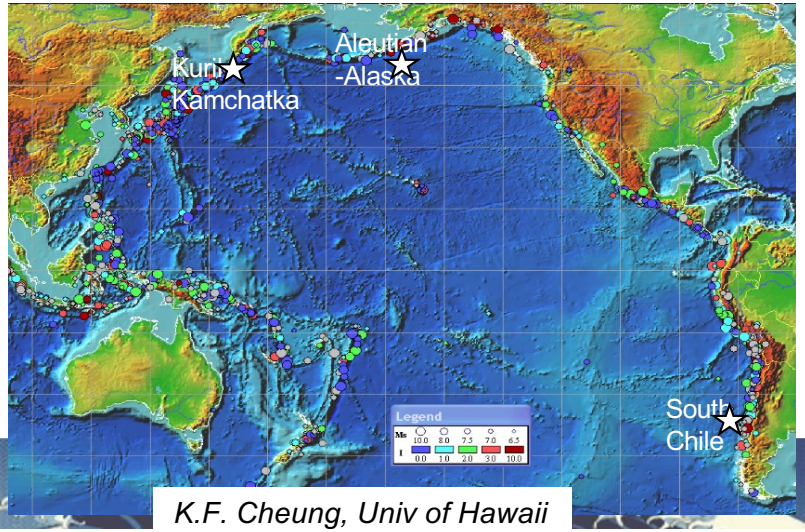
Maritime Hazard Modeling & Mapping - Hawaii

Maritime and Scientific Community Input

- USCG, PTWC, HDOT, Matson, Sause, Foss (Young Brothers), Kirby, and Pilots Association
- Hawaii Earthquake and Tsunami Advisory Committee
- National Tsunami Hazard Mitigation Program

Data Products

- **Offshore currents - Mw 9.3 / 9.6 Aleutian scenarios for safe zones**
- **In-harbor hazard maps of current, surge & drawdown for advisory-level tsunamis**



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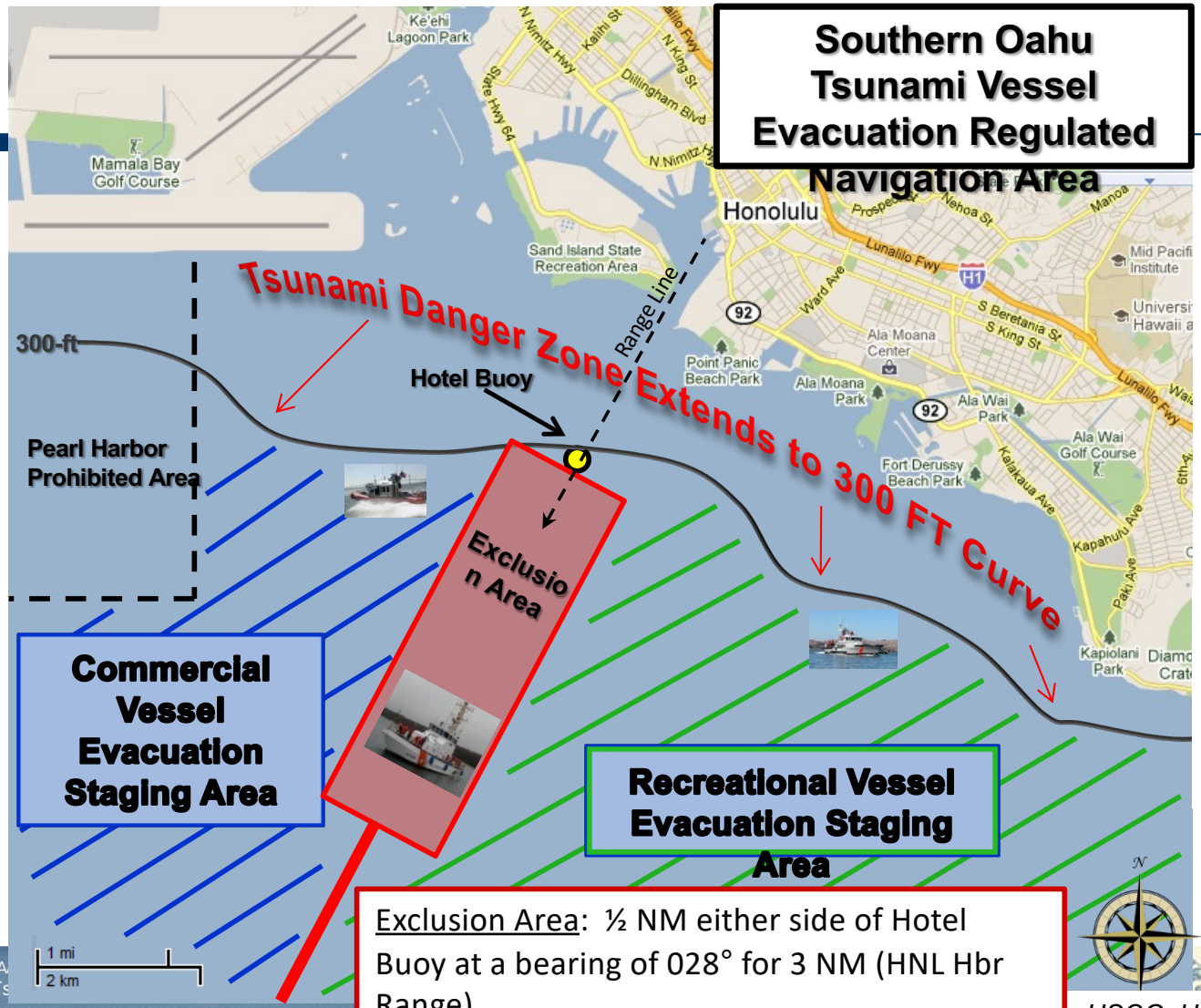
Database of scenarios

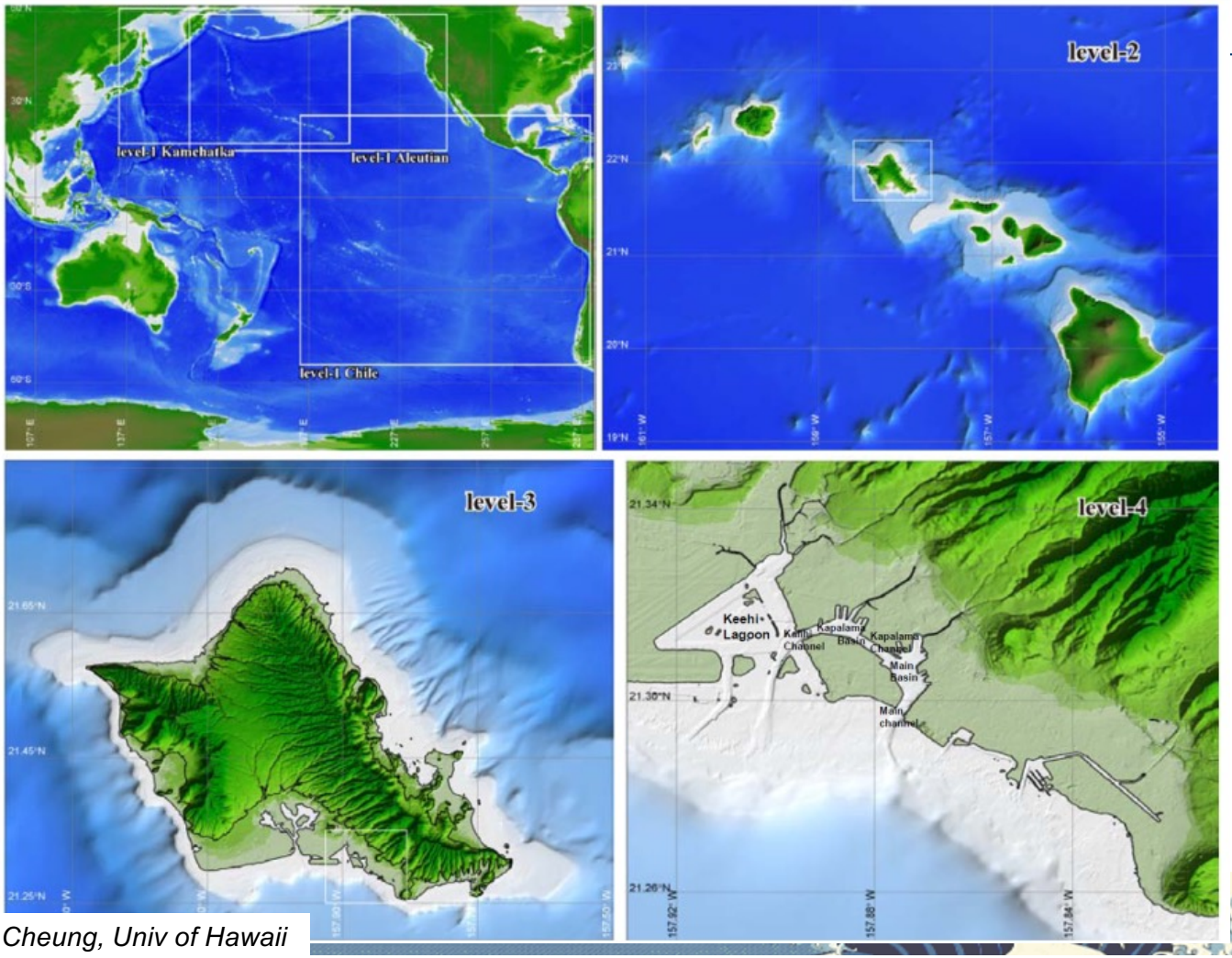
- Three major subduction zones
- Earthquake at 0.1 Mw increments up to ~2 m nearshore wave amplitude
- Modeling of all events at mean-sea level



Exclusion Area: ½ NM either side of Hotel Buoy at a bearing of 028° for 3 NM (HNL Hbr Range)

USCG, HI-EMA

Computational Grids



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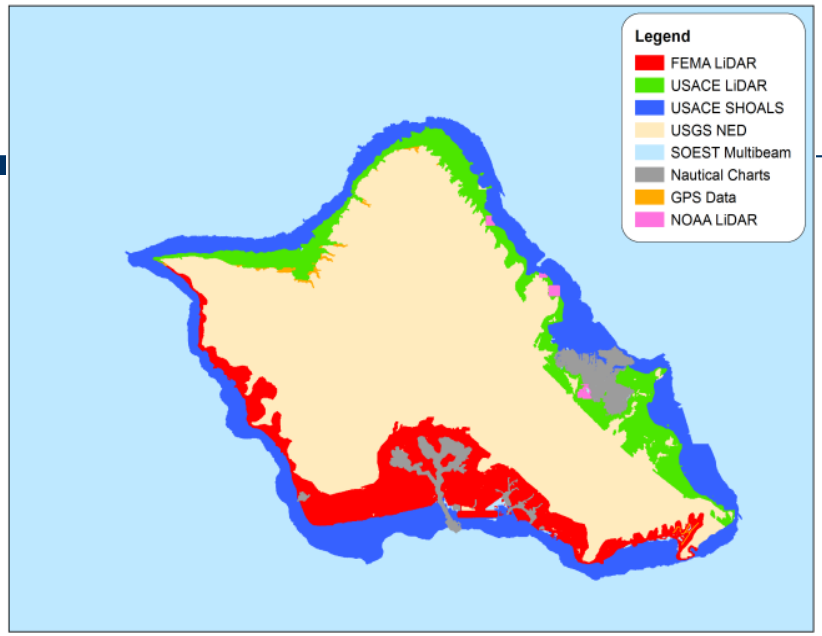
Digital Elevation Model

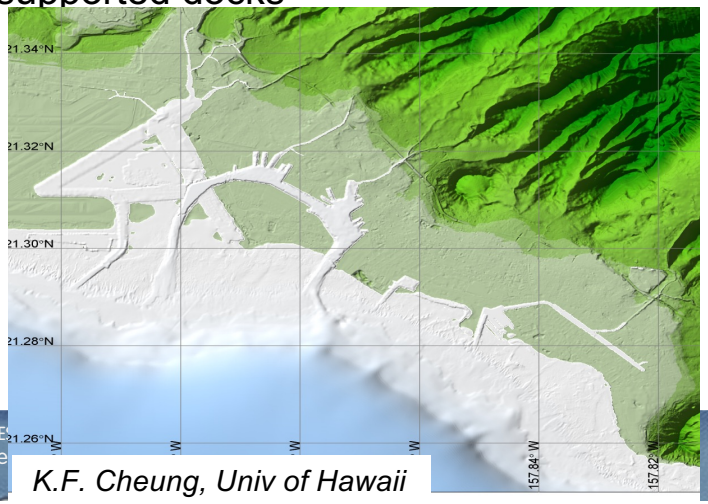
High Resolution Data

- FEMA, USACE, and DHS LiDAR topography (1 m resolution)
- NASA SRTM topography (30 m)
- USACE LiDAR bathymetry (3 m)
- SOEST multibeam data (50 m)

Modification of DEM

- US Army Corps survey data
- Pile supported docks





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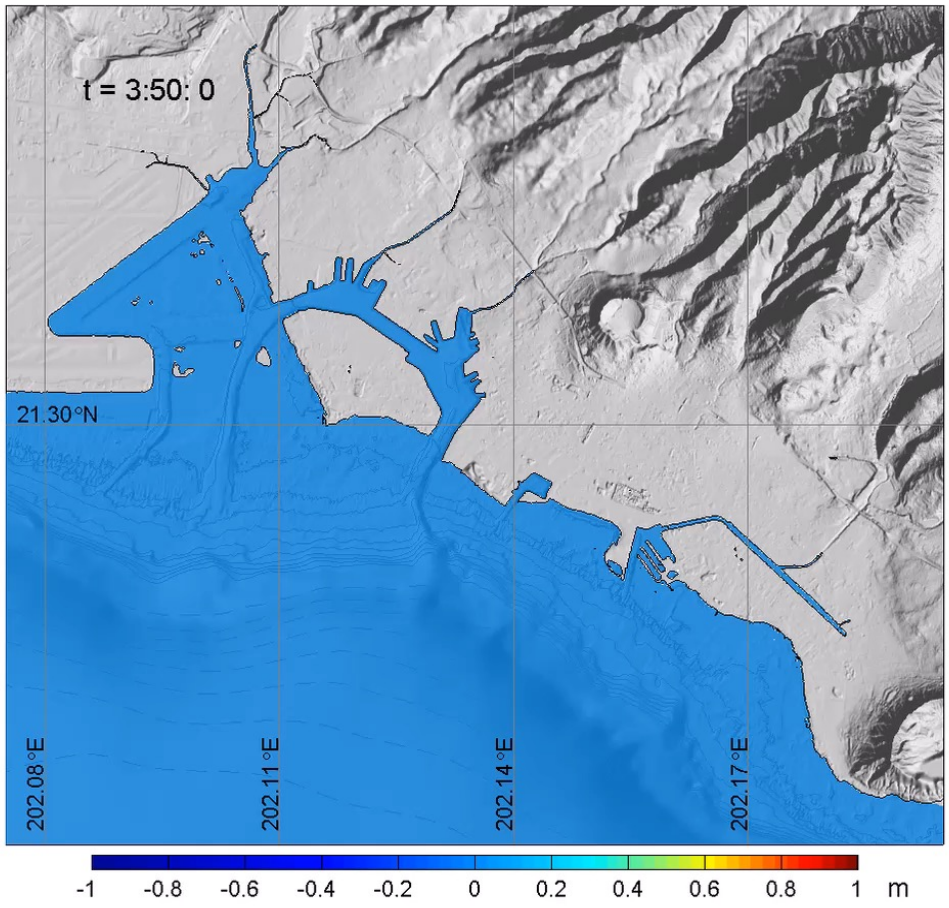
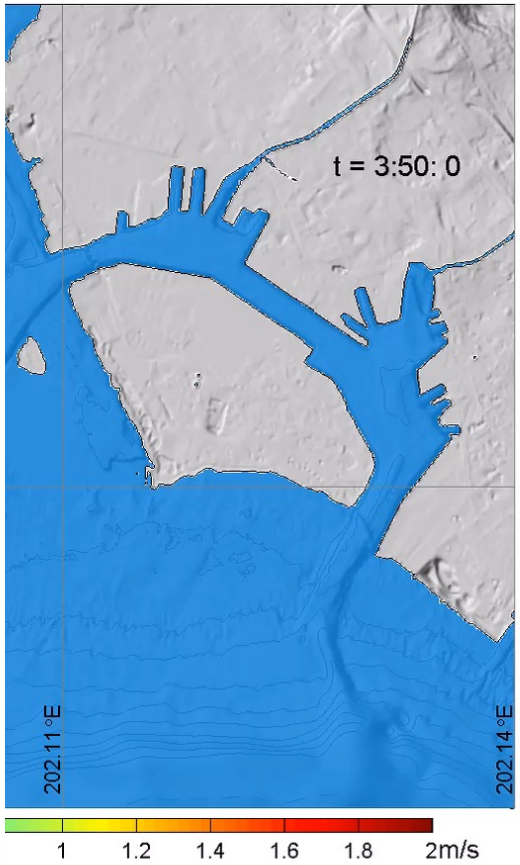
Hawaii Department of Transportation

Mw 8.4 Aleutian Islands

SURFACE ELEVATION



CURRENT SPEED



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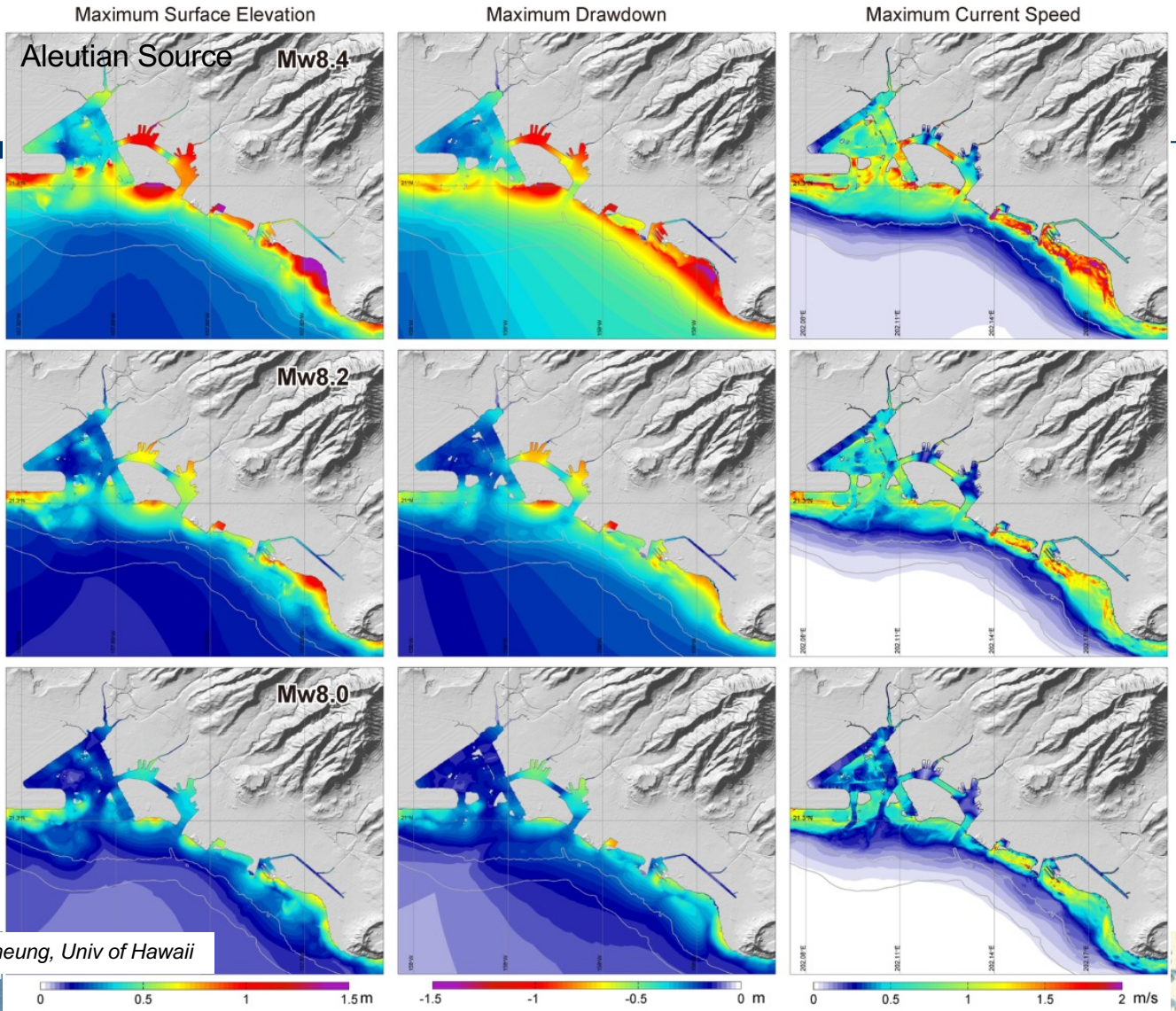

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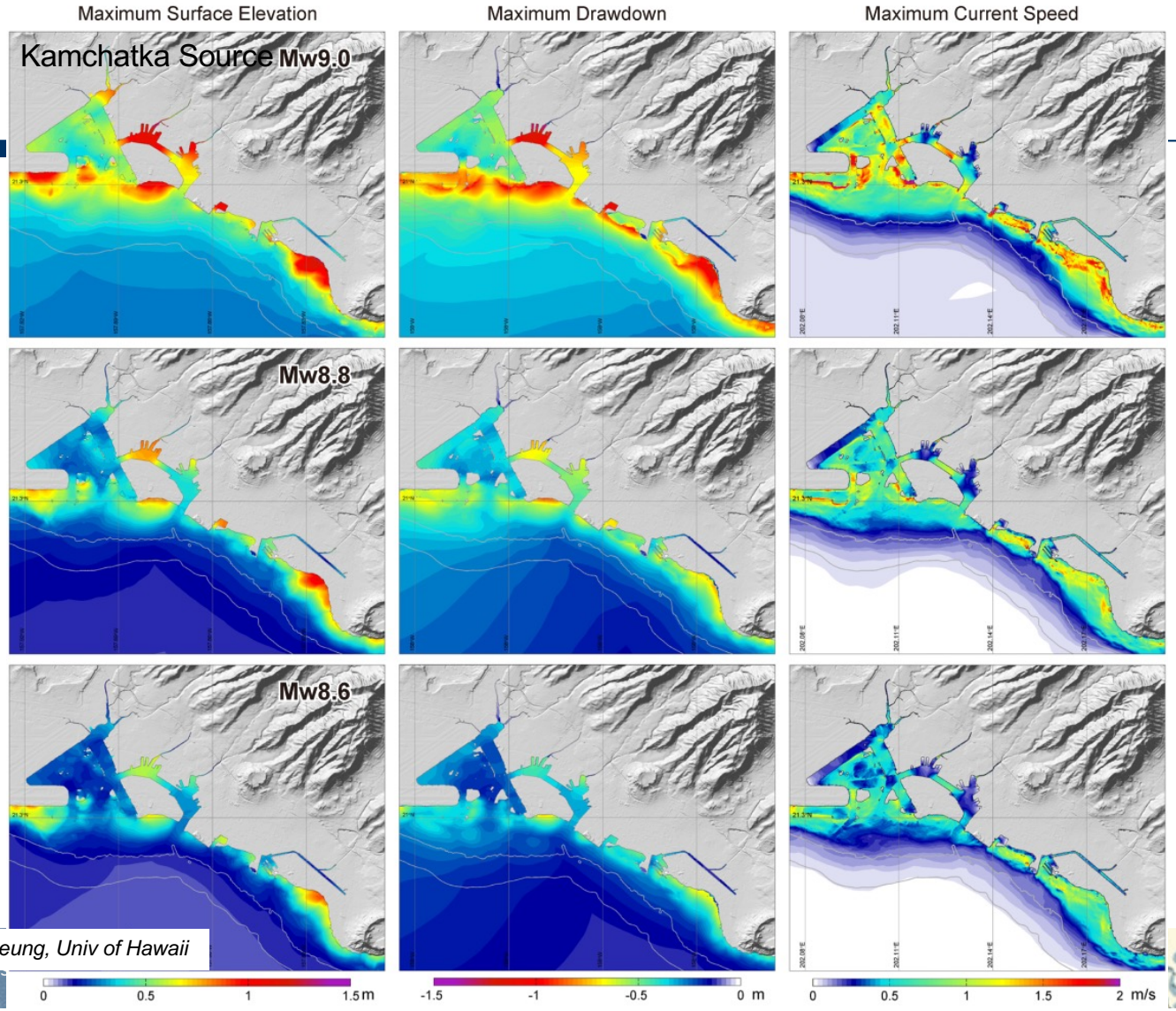

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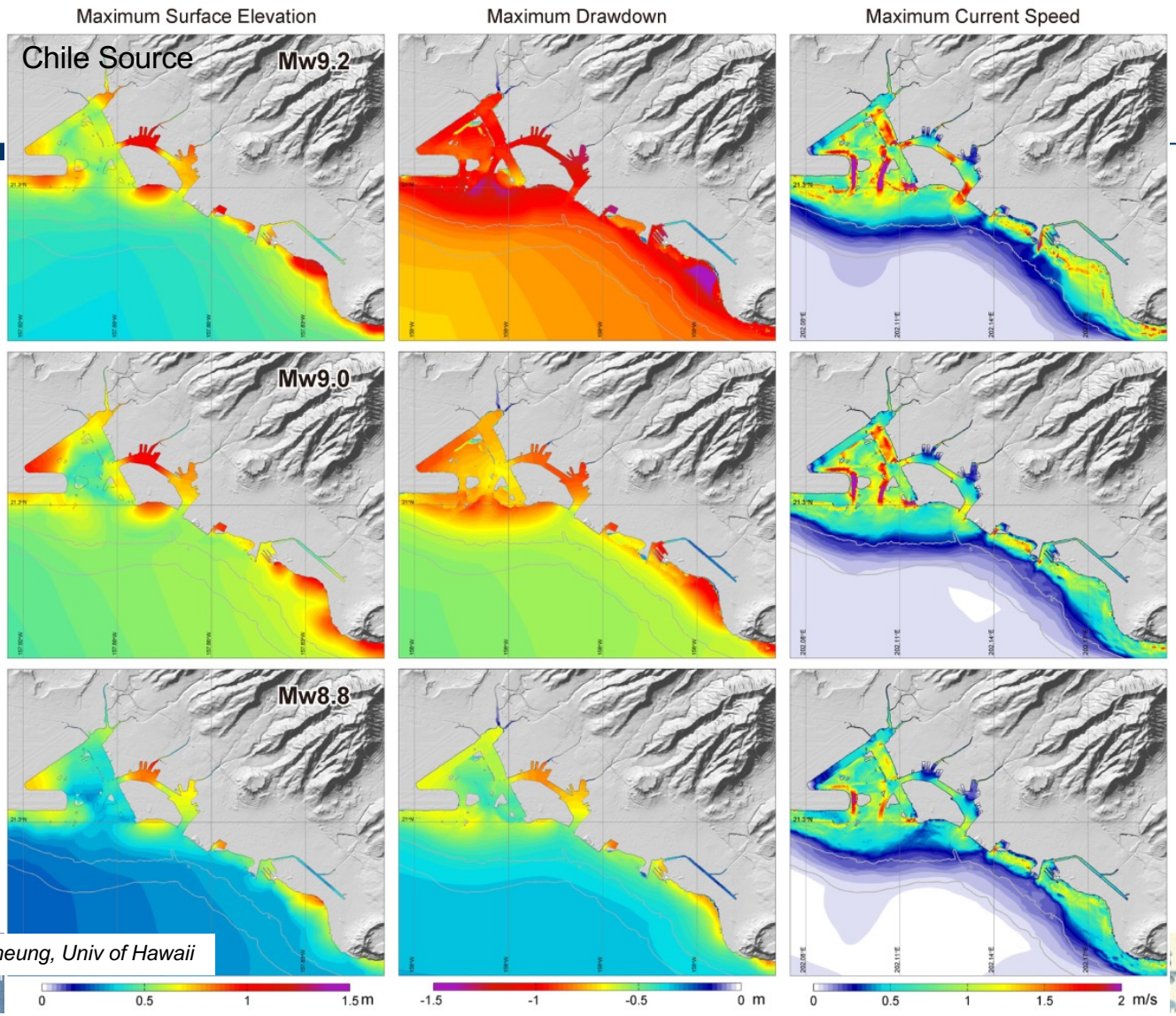

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DRAFT - NOT FOR DISTRIBUTION

US Coast Guard – Summary Table for Aleutian Tsunamis

Earthquake Magnitude	Water Surface Rise/Fall			Water Current	
	Surge from Mean High Water (feet)	Drawdown from Mean Low Water (feet)	Cycle Time Range (minutes)	Speed (knots)	Cycle Time Range (minutes)
7.6	0.6	-0.7	9 – 20	0.6	9 – 20
7.7	0.8	-0.9	9 – 20	0.7	9 – 20
7.8	1.0	-1.2	10 – 20	0.9	9 – 20
7.9	1.3	-1.5	10 – 20	1.2	9 – 20
8.0	1.8	-2.0	10 – 20	1.6	9 – 20
8.1	2.2	-2.4	10 – 20	2.1	10 – 20
8.2	3.0	-3.3	10 – 20	2.7	10 – 20
8.3	3.6	-4.3	10 – 21	3.5	10 – 21
8.4	4.7	-4.7	11 – 21	4.8	11 – 21

Important 3 data products

- Surge, drawdown, and current

Tsunami scenarios – Honolulu, Oahu

- Mw 9.3 & 9.6 Aleutian, Mw 7.7-8.4 Aleutian
- Mw 8.1-9.0 Kamchatka, Mw 8.3-9.2 Chile, Oahu

Guam - Community Input and Participation

Site visits and meetings with local communities to define data products (January 16 – 18, 2018)

USCG Sector Guam

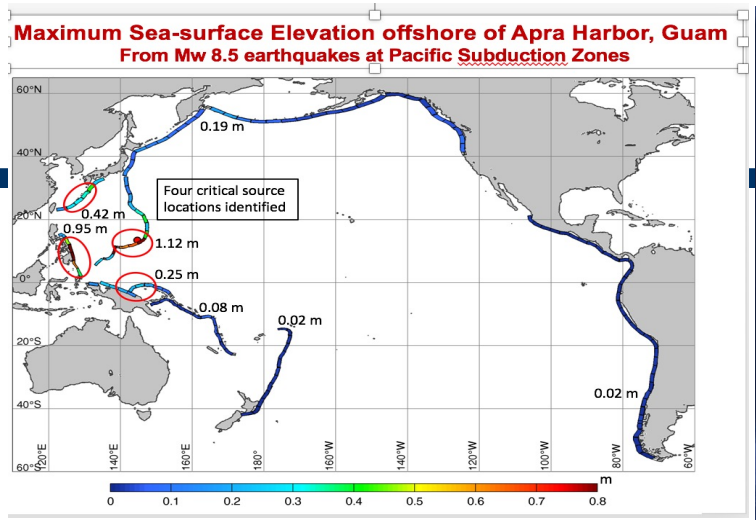
- Integration of advisory-level tsunami scenarios into its severe weather plan
- Coordination with Port Authority of Guam and Naval Base Guam in plan development
- Consultation with USCG Sector Honolulu, which has already incorporated tsunami scenarios into its severe weather plan

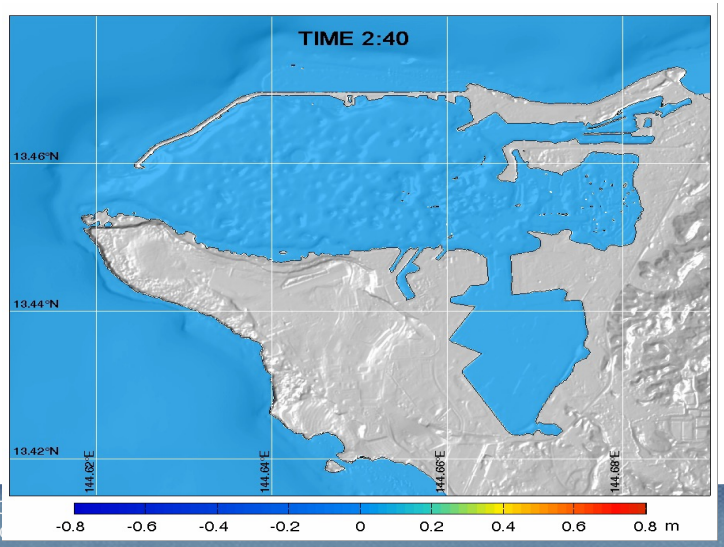
Guam Power Authority

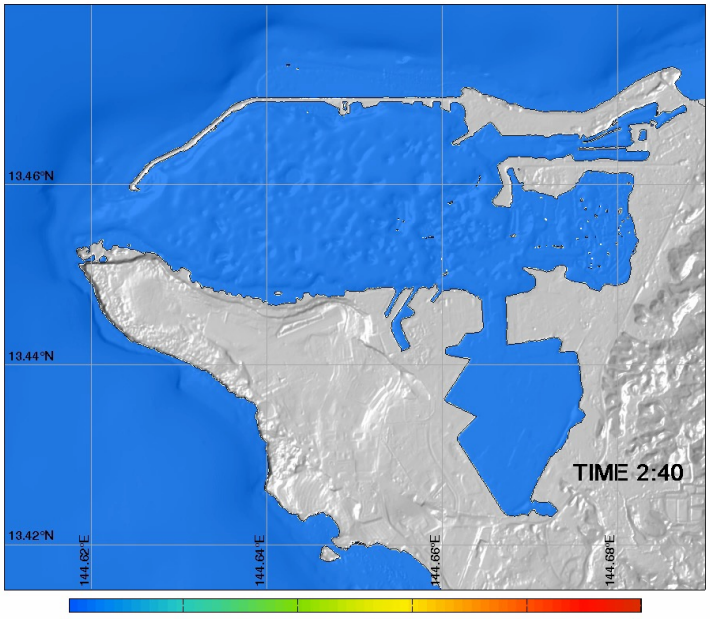
- Utilization of extreme tsunami scenarios in impact assessment of its power plant and fuel storage as well as siting of new facilities at Apra harbor

Guam Waterworks Authority

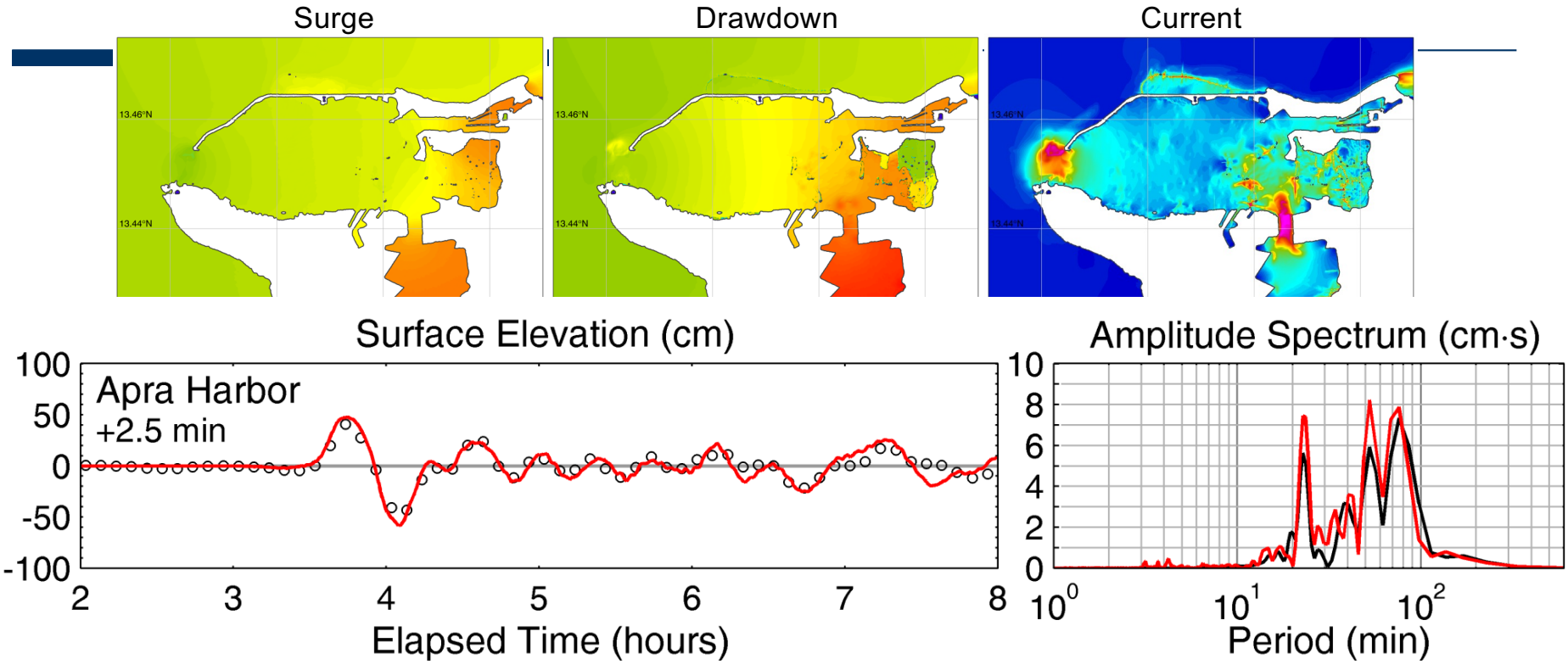
- Utilization of extreme tsunami scenarios in vulnerability assessment of wastewater treatment plant at Agana Bay


Maximum Sea-surface Elevation offshore of Apra Harbor, Guam
From Mw 8.5 earthquakes at Pacific Subduction Zones
Four critical source locations identified
0.19 m
0.42 m
0.95 m
1.12 m
0.25 m
0.08 m
0.02 m
0.02 m
60°N
40°N
20°N
0°
20°S
40°S
120°E
140°E
160°E
180°
160°W
140°W
120°W
100°W
80°W
60°W
m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8


TIME 2:40
13.46°N
13.44°N
13.42°N
144.62°E
144.64°E
144.66°E
144.68°E
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8 m

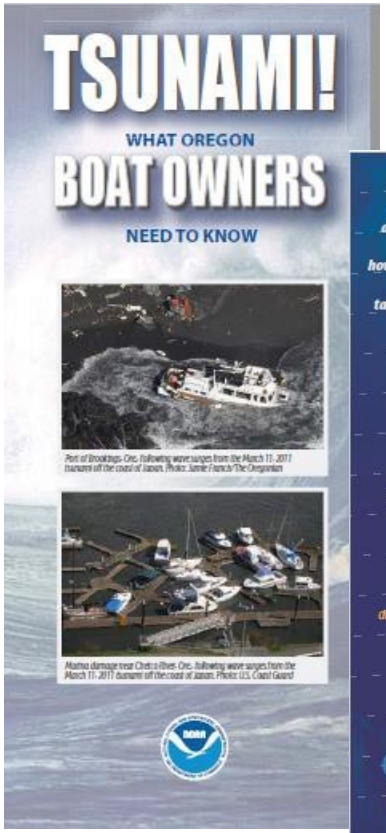

13.46°N
13.44°N
13.42°N
TIME 2:40
144.62°E
144.64°E
144.66°E
144.68°E

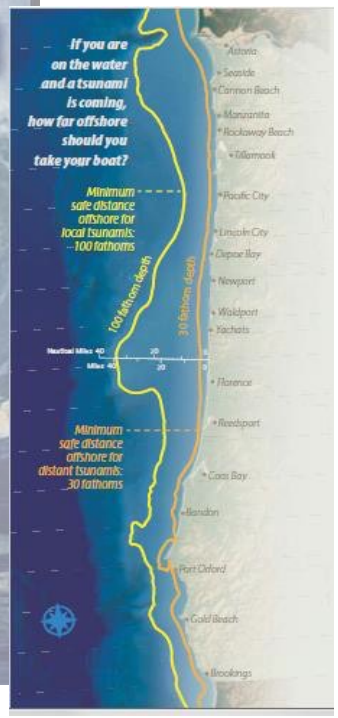
Model Calibration - Results based on the 2011 Tohoku Tsunami



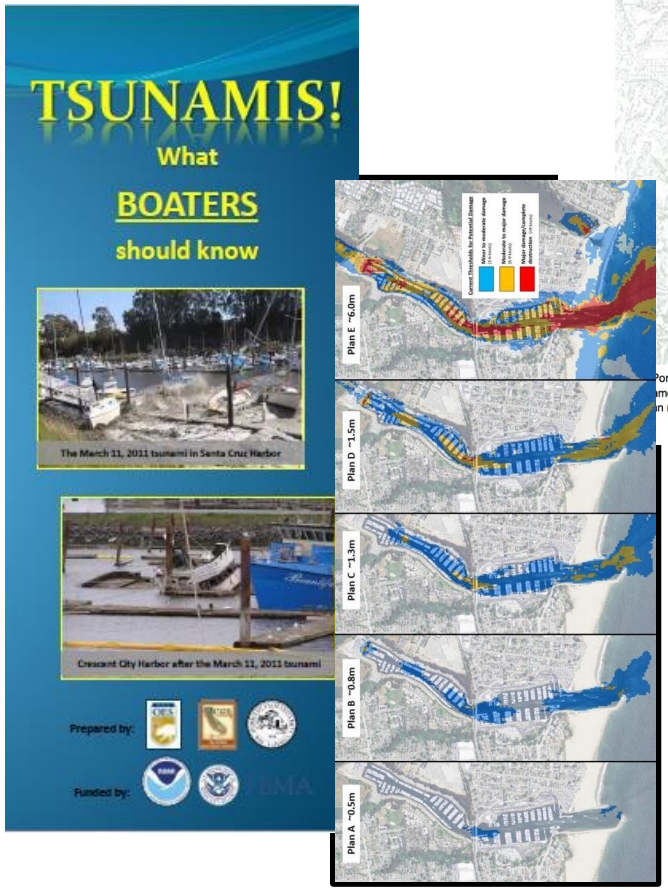
US NTHMP Outreach Products - Boaters

2-Level Response Guidance	Multiple-Level Response Guidance

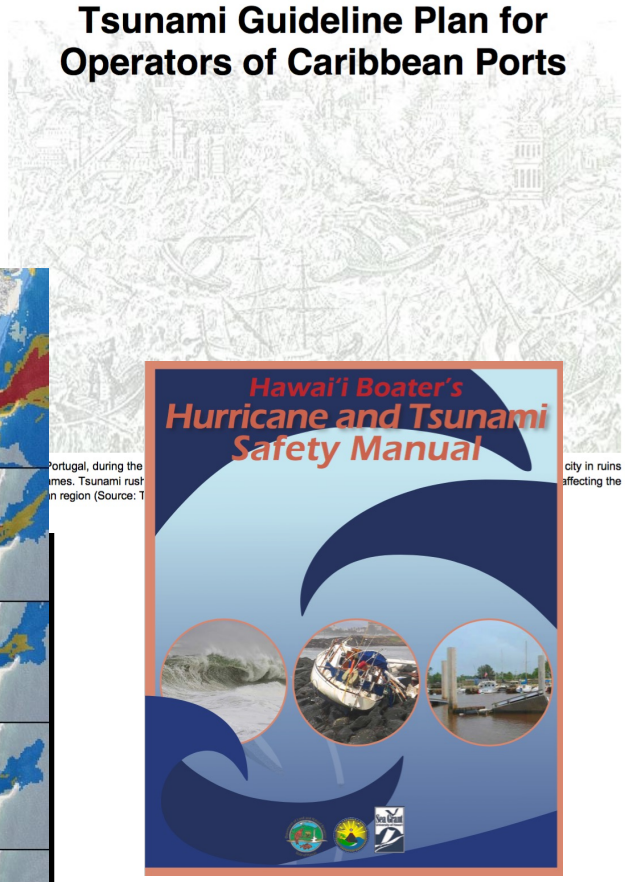




Warning /



Scenario-



Thank You

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Director, ITIC