Hawaii and Pacific Islands

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UH/ORE

Digital Elevation Model

Data Sources
- GEBCO (0.5 min)
- NGDC ETOPO1 (1 min)
- UH SOEST Multi-beam (~50 m)
- USACE SHOALS bathymetry to 40 m depth (~3 m)
- NOAA, USACE & FEMA LiDAR topo to 15 m elevation (~1m)
- Hydrographic surveys
- Digitization of maps & charts
- National Elevation Dataset

Topo above 15-m Elev
- Department of Homeland Security
- National Geospatial Intelligence Agency
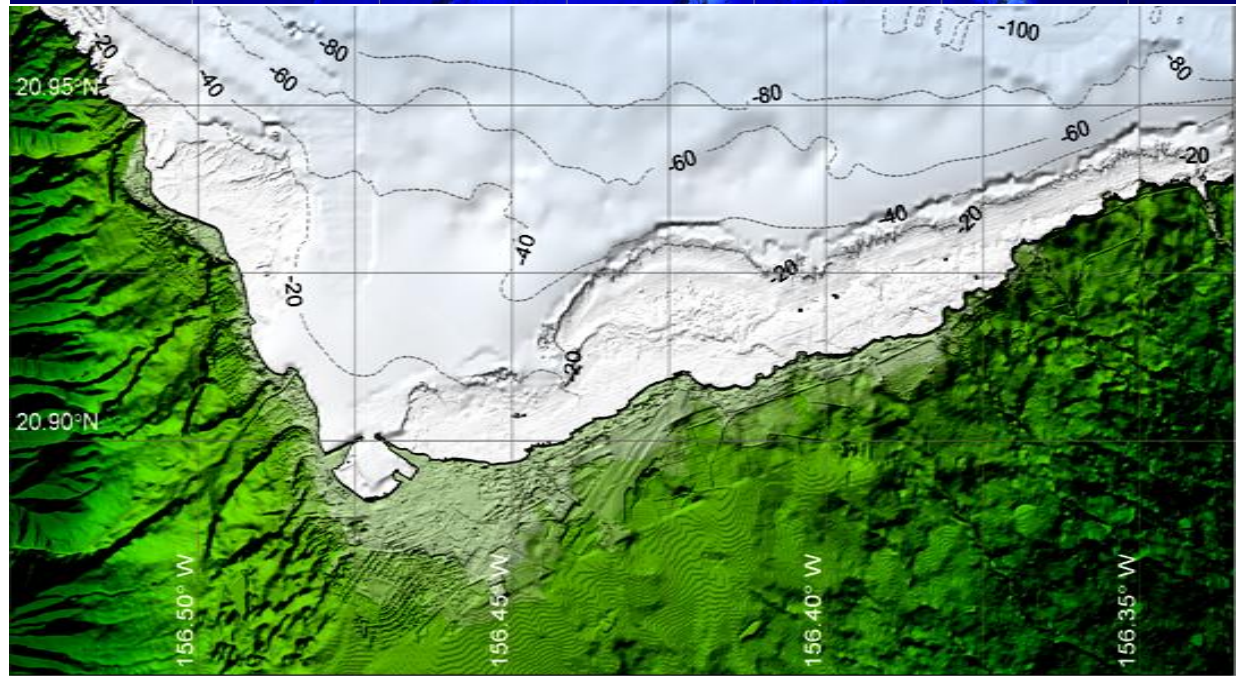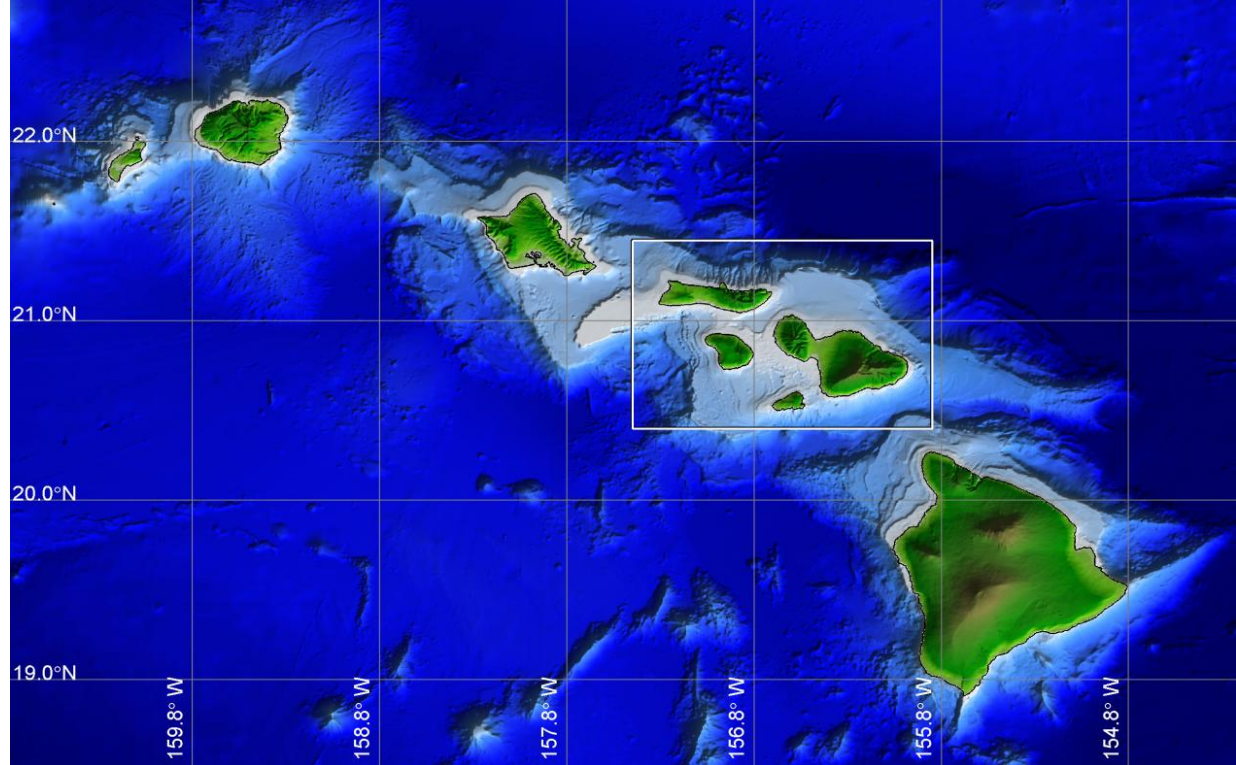
Tsunami Models

Shock-capturing Dispersive Models (NEOWAVE, BOSZ)
• Depth-integrated models accounting for vertical flow structures
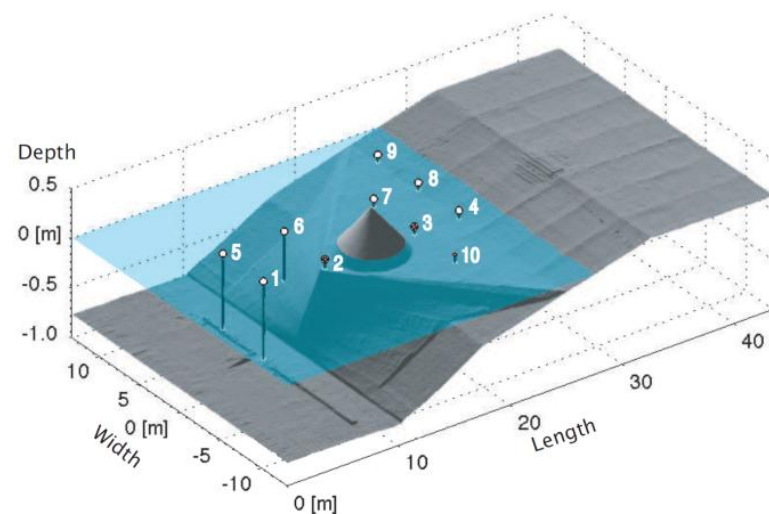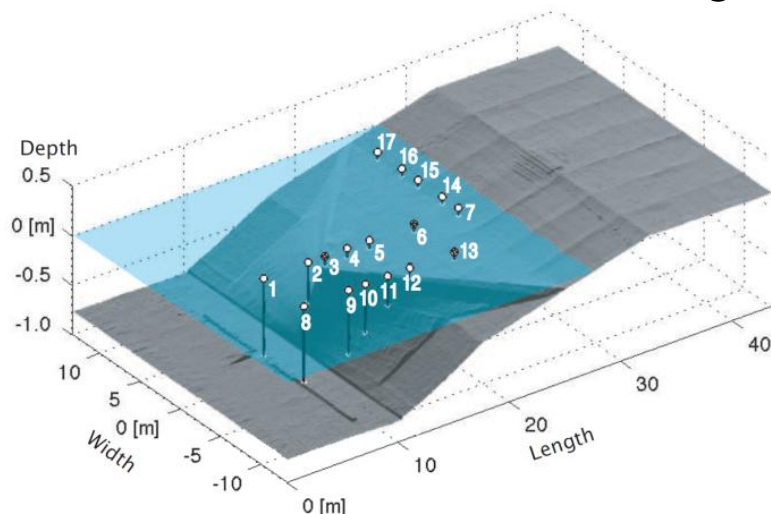• Approximation of breaking waves as bores or hydraulic jumps

NSF Laboratory Experiments at OSU in Fall 2007 and Summer 2009
• Over 1500 tests for different reef configurations and wave conditions
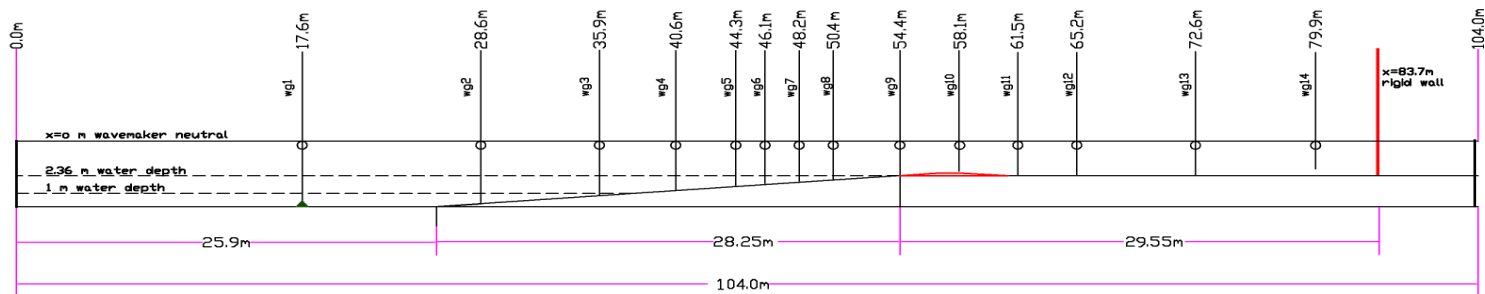
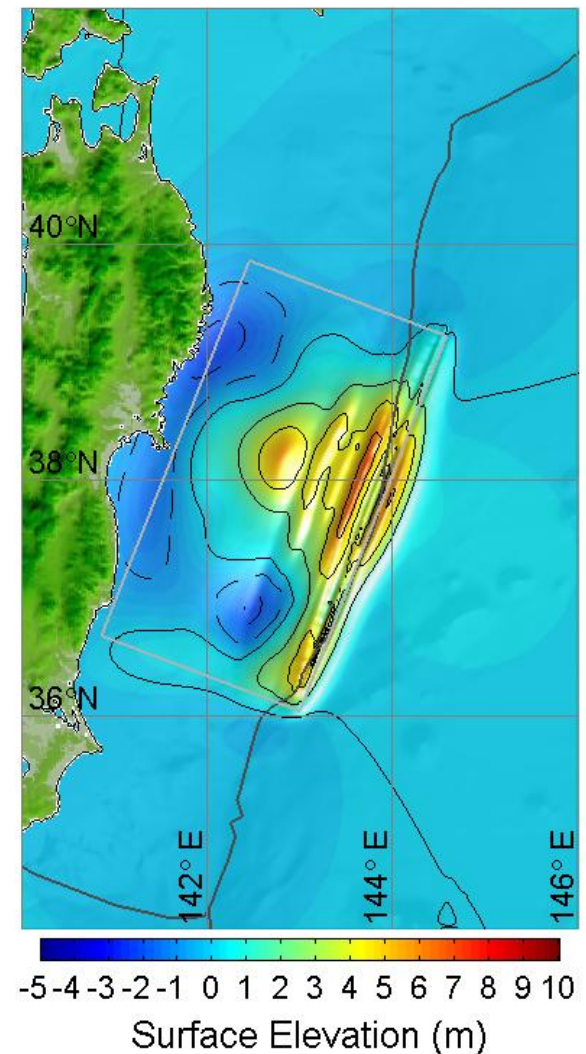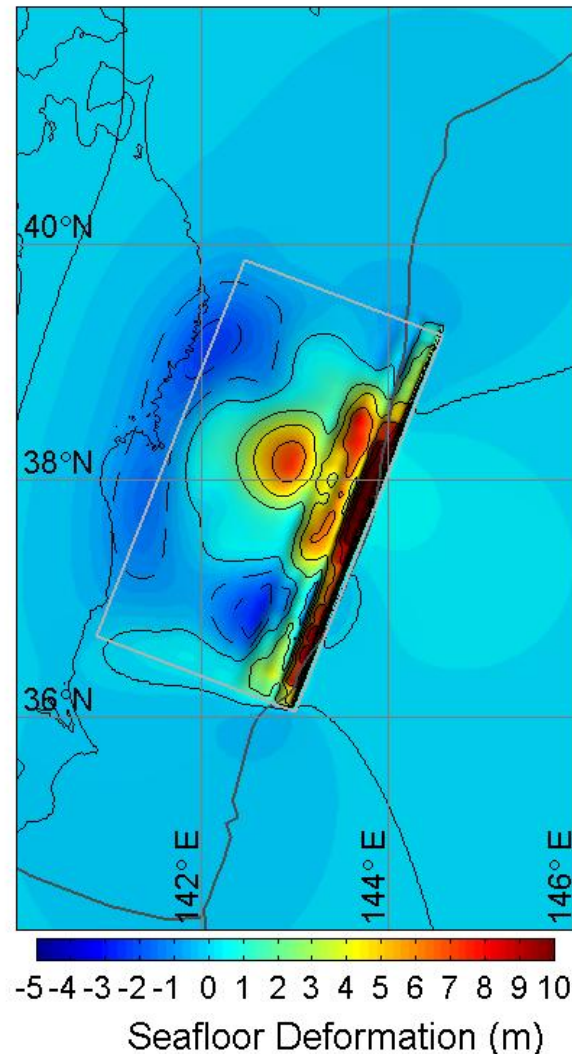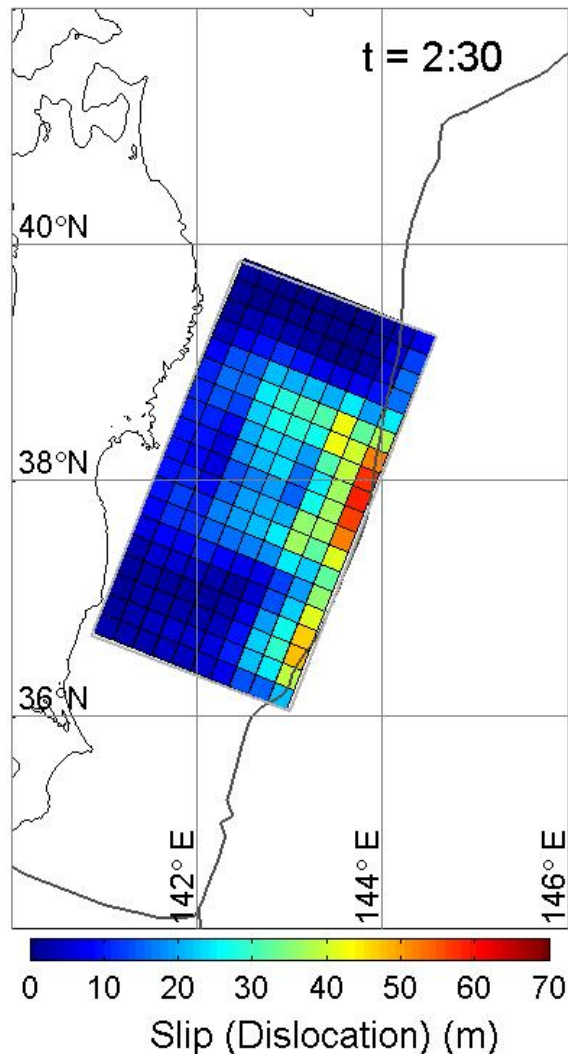NSF Laboratory Experiments at OSU in Fall 2009 by Pat Lynnett
• Three-dimensional reef configurations

The 2011 Tohoku Earthquake and Tsunami Generation

Finite fault solution from p-wave inversion (Yamazaki, Lay, Cheung, Yue, and Kanamori; *GRL* 2011)
• Mw 9.0 with 2.5 min of rupture duration and 70 m of near-trench slip

The 2011 Tohoku Earthquake and Tsunami Generation

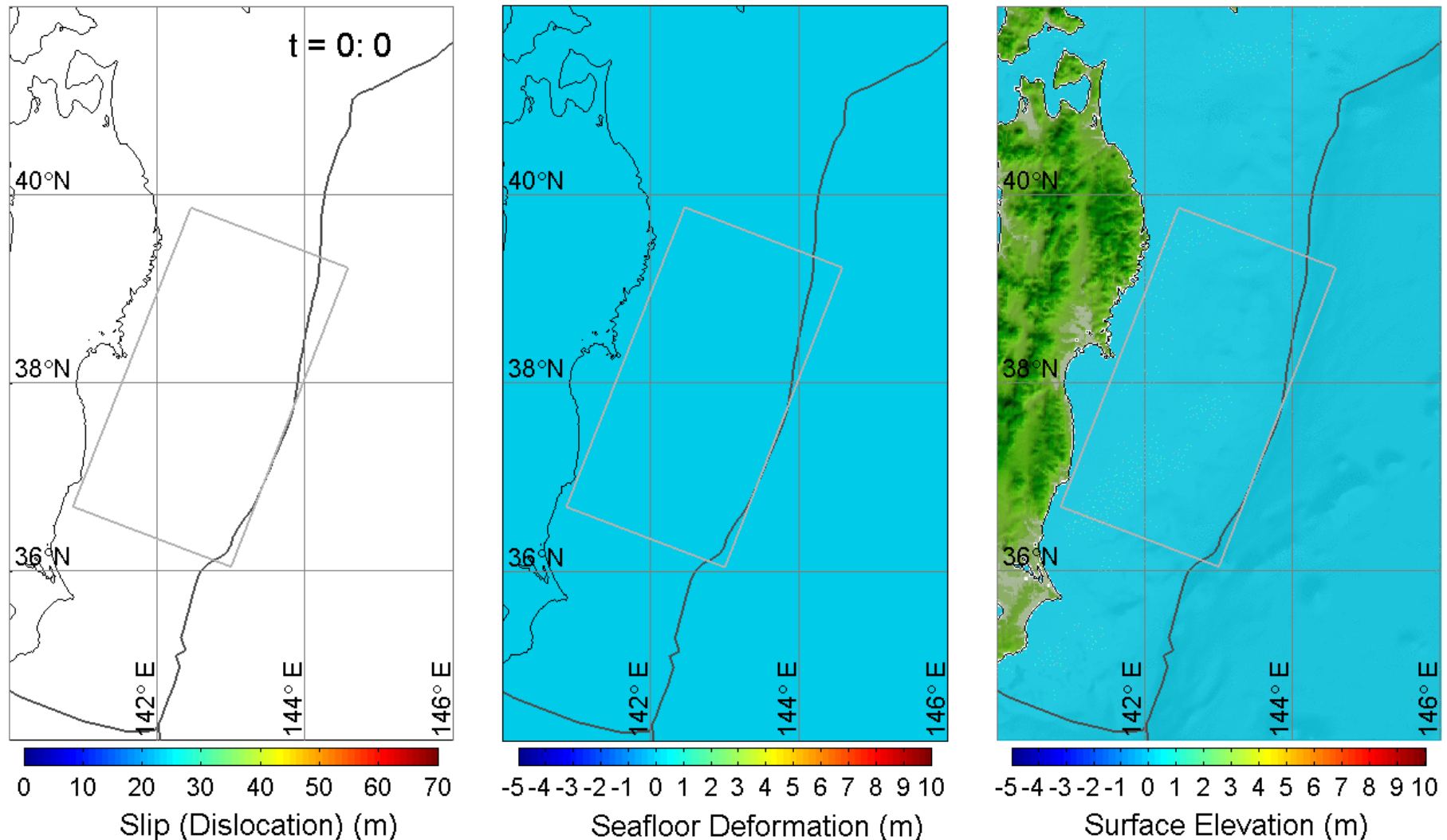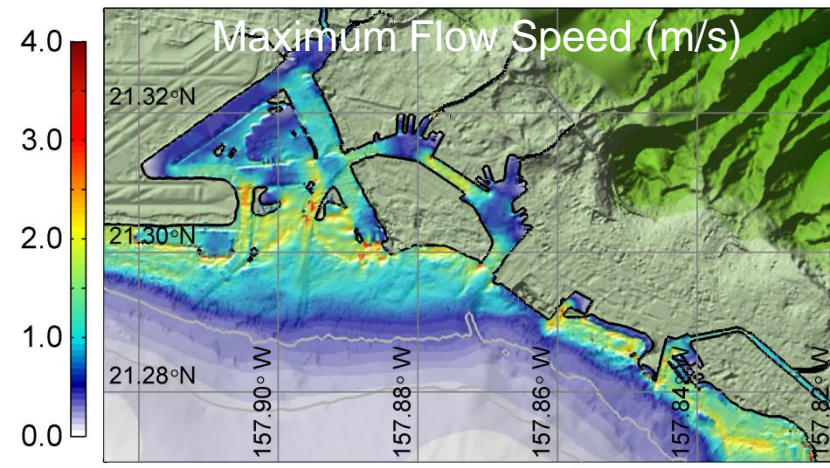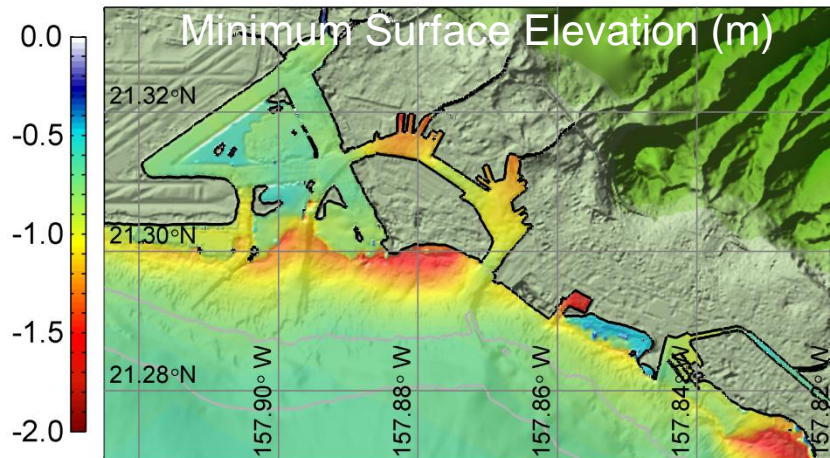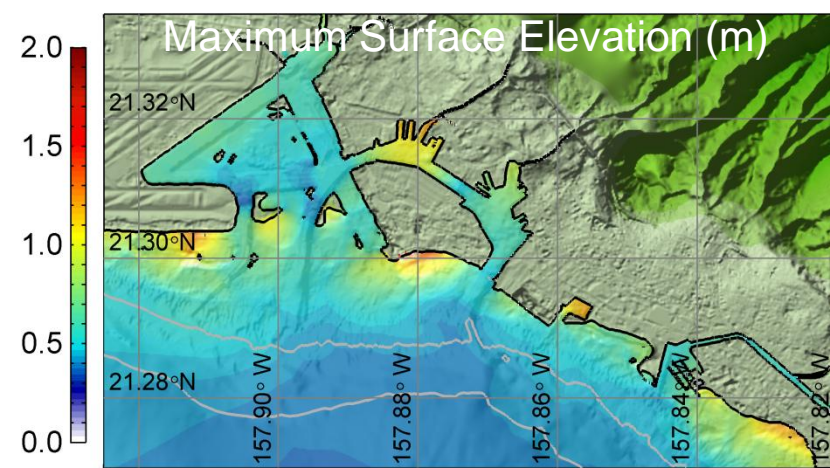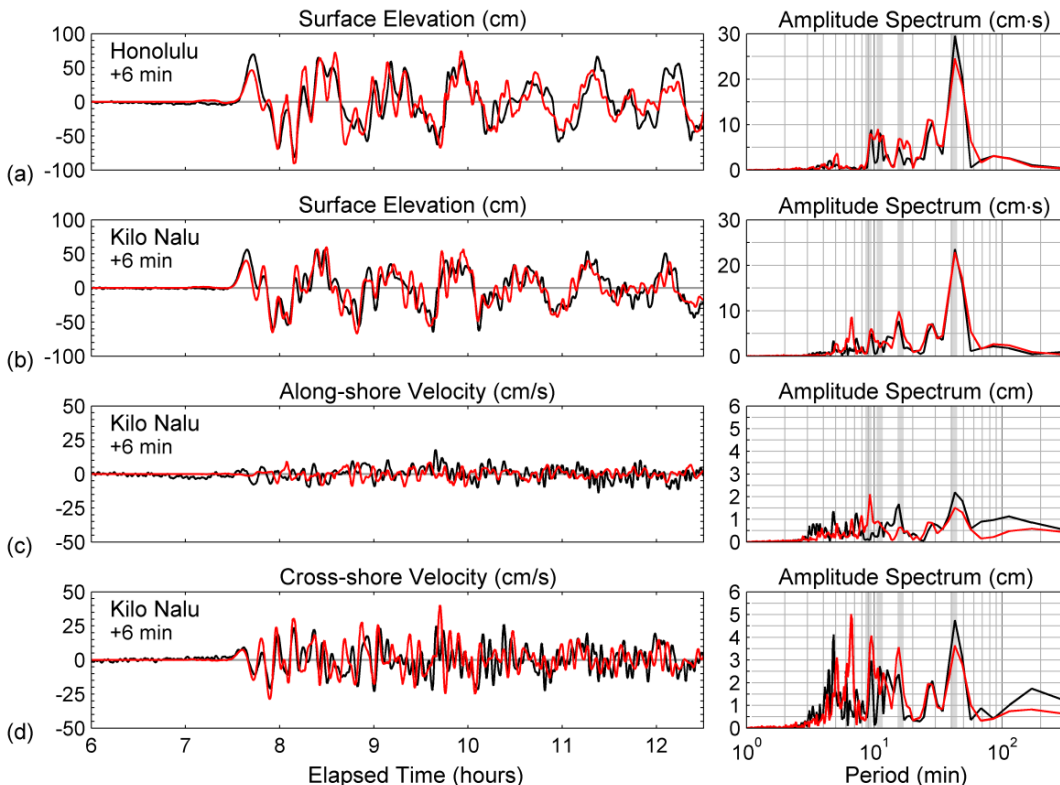Finite fault solution from p-wave inversion (Yamazaki, Lay, Cheung, Yue, and Kanamori; *GRL* 2011)
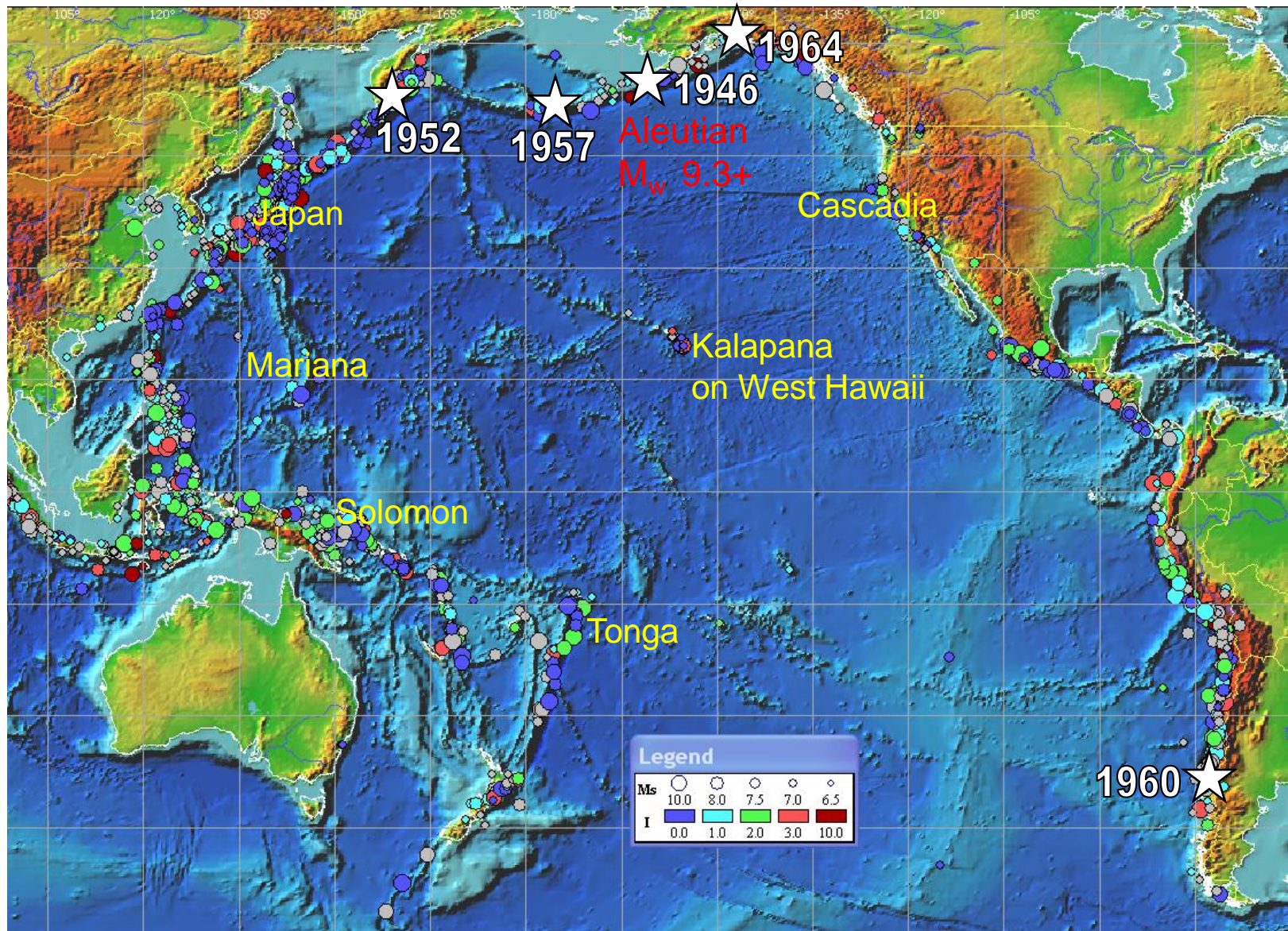- Mw 9.0 with 2.5 min of rupture duration and ~65 m of near-trench slip

Honolulu Harbor

- Seiches in Harbors from Oahu to Maui

- Hanauma Bay closed for 3 days due to strong currents

- Persistent wave activities indicative of resonance
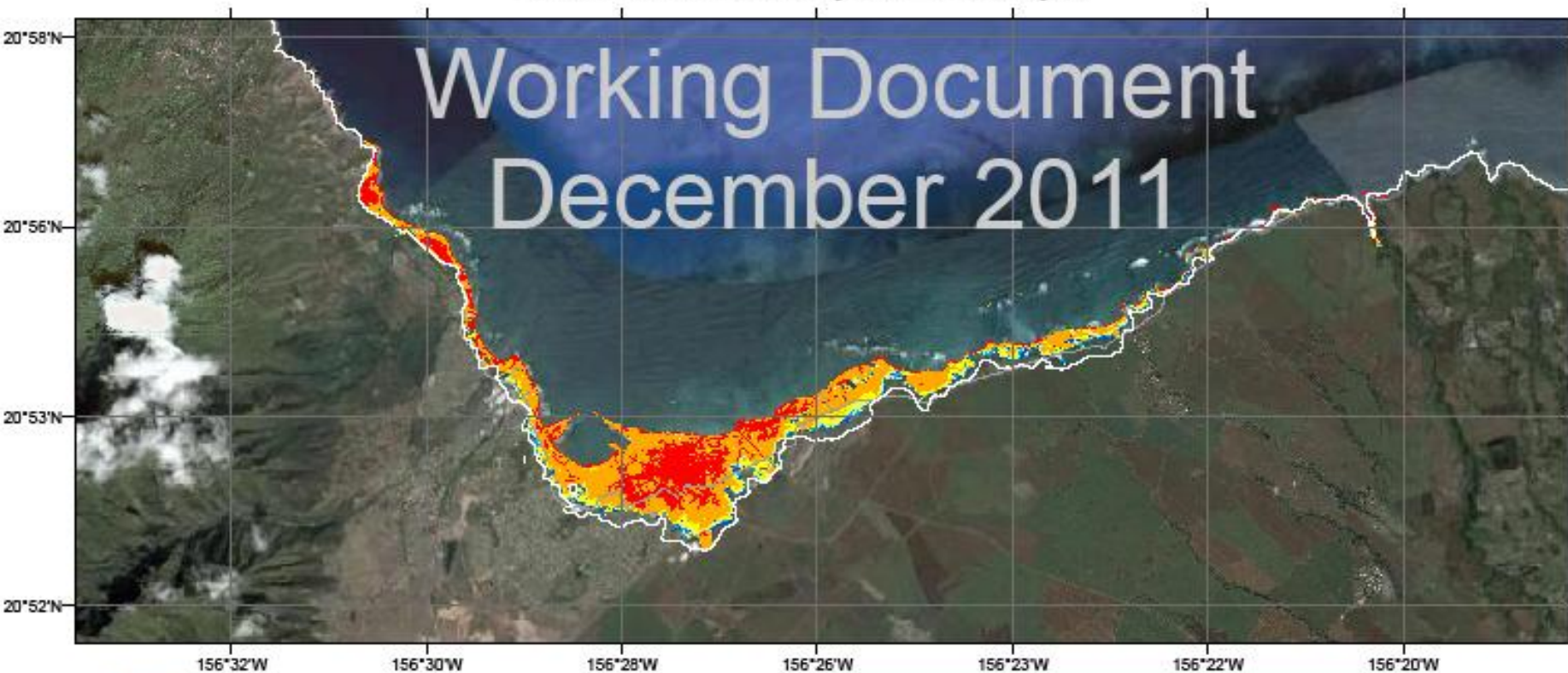
- Yamazaki, Cheung, Pawlak, and Lay (*GRL* 2012)

Historical and Hypothetical Tsunamis

Kahului Flow Depth Envelope

Working Document
December 2011

20°58'N
20°56'N
20°53'N
20°52'N

156°32'W   156°30'W   156°28'W   156°26'W   156°23'W   156°22'W   156°20'W

0 0.5 1   2   3   4
Miles

00.51 2   3   4
Kilometers

UH ORE
December, 2011

Legend

Kahului Envelope
Max. Flow Depth (m)

- 0- 0.3
- 0.3 - 0.6
- 0.6 - 1
- 1 - 2
- 2 - 5
- 5 - 10
- > 10

———— 10m Topographic Contour
———— 1991 Evacuation Limit
▨ Communities

Summary

Digital Elevation Model

- High-resolution topography above 15-m elevation

Tsunami Model

- Validation with the 2011 Tohoku tsunami
- Near-field inundation and runup in Japan
- Far-field impact in Hawaii

Inundation Mapping Criteria

- Historical events (completed for all four counties)
- *Maximum probable* events from the Aleutians