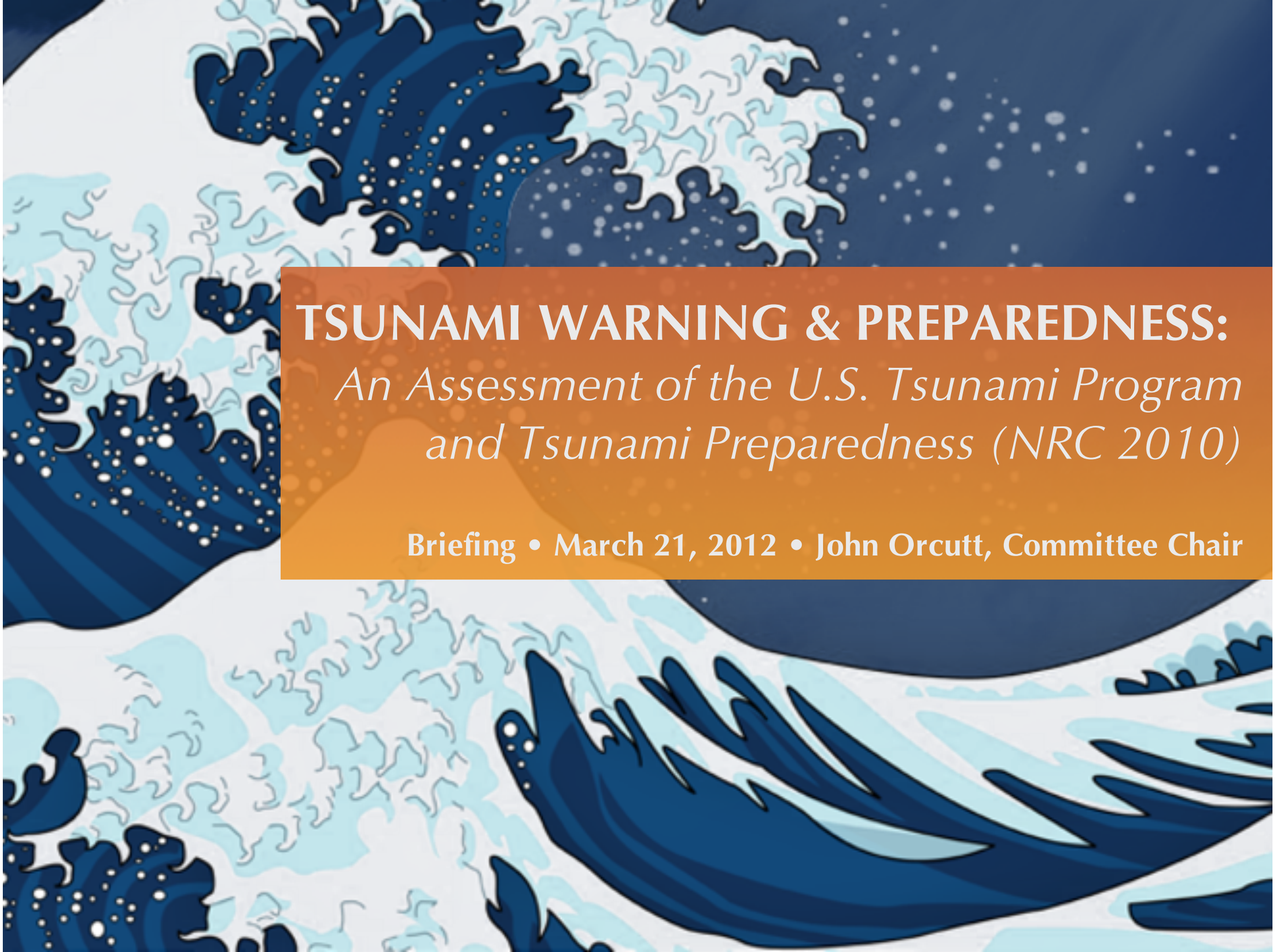
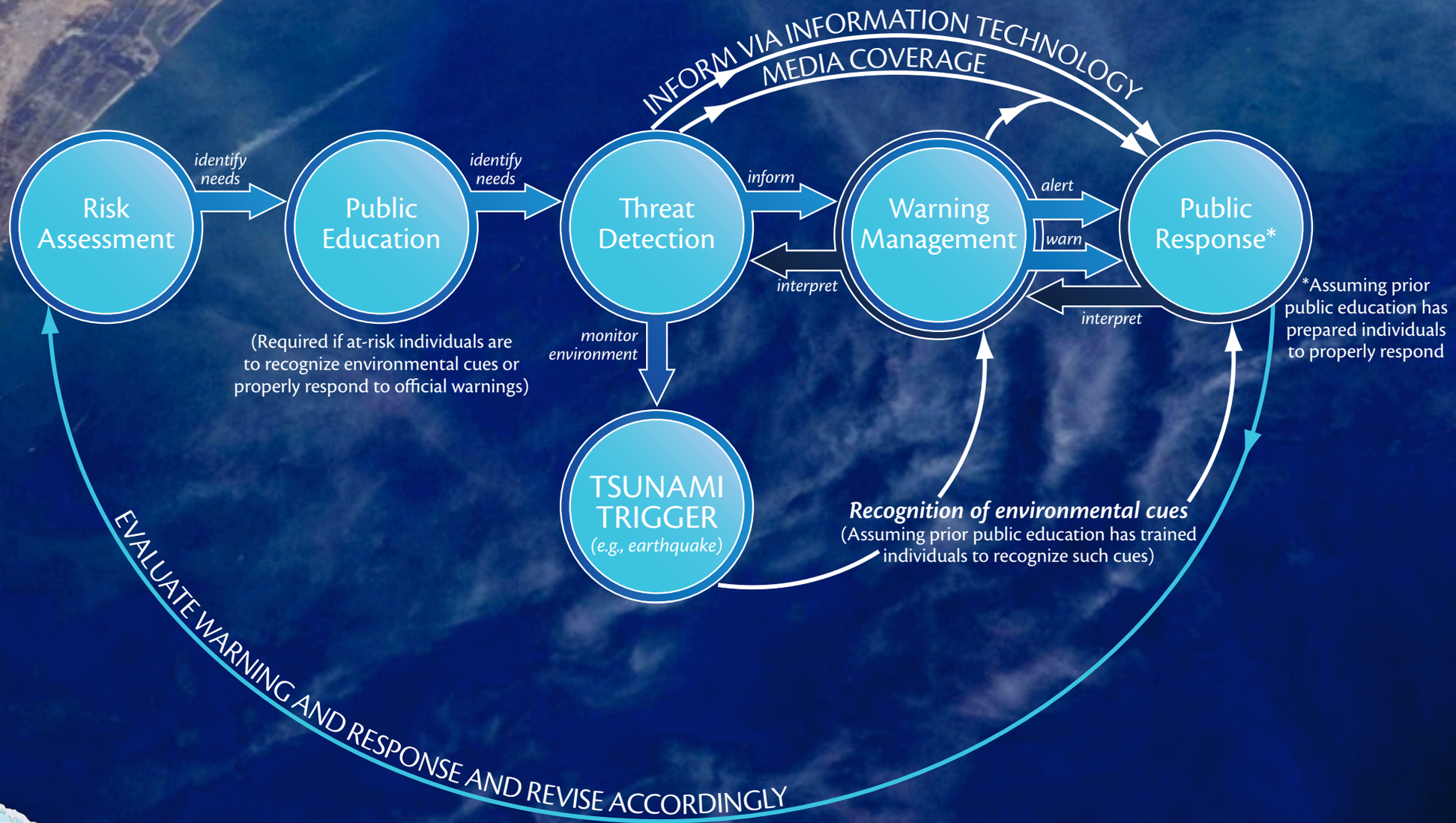


TSUNAMI WARNING & PREPAREDNESS:

An Assessment of the U.S. Tsunami Program and Tsunami Preparedness (NRC 2010)

Briefing • March 21, 2012 • John Orcutt, Committee Chair

The Ideal End-to-End System



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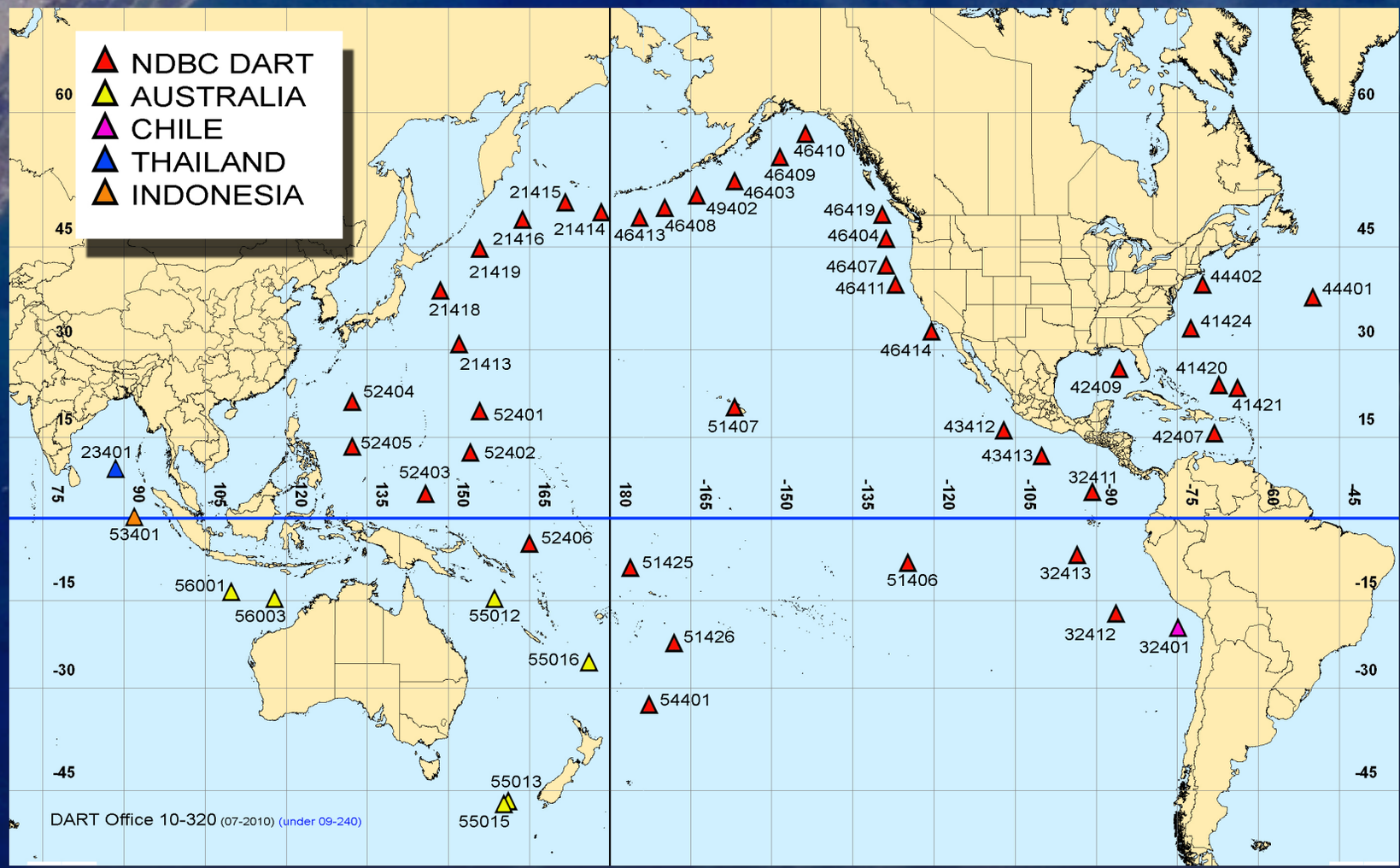
Threat Detection



GLOBAL SEISMOGRAPHIC NETWORK

GSN

2/2012

★ IRIS / IDA Stations ★ IRIS / USGS Stations ★ Affiliate Stations ★ Planned Stations

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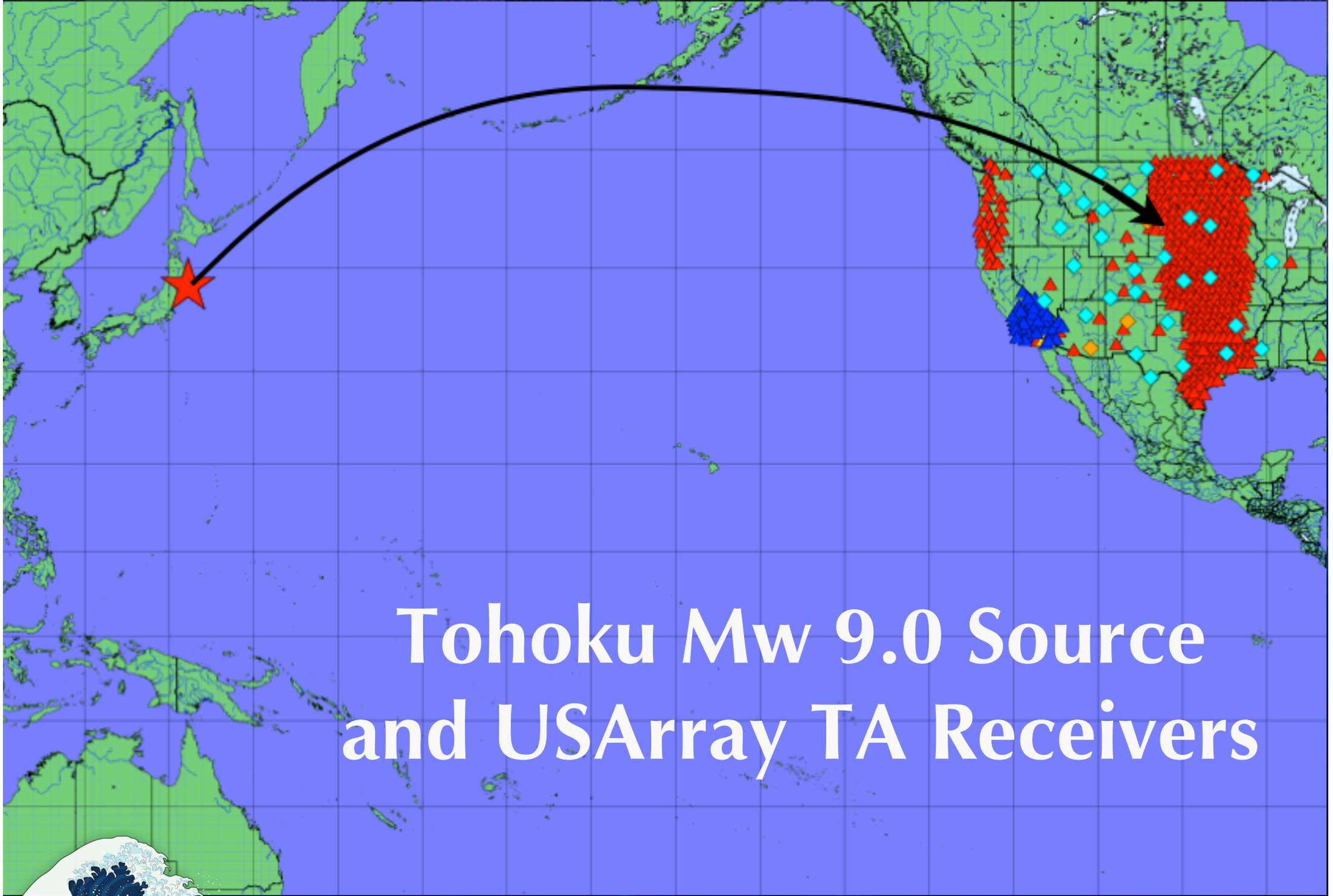
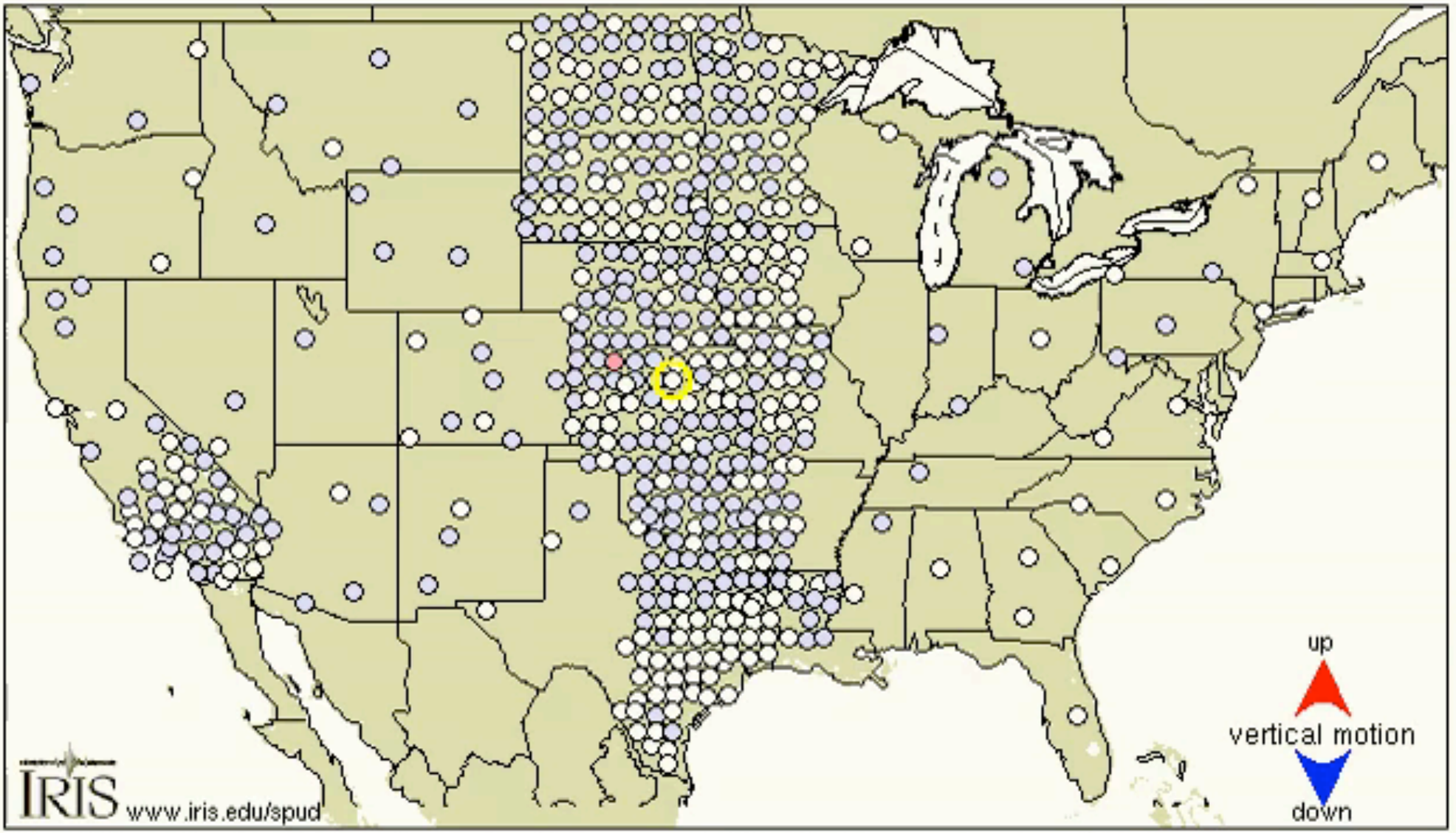
(c) 2004 - 2004 Array Network Facility, http://anf.ucsd.edu
km
0
500
km
0
500
Network Legend
AZ (UC San Diego) [2]
BK (UC Berkeley) [17]
CI (CalTech) [43]
IU GSN [0]
NN (UN Reno) [0]
TA (USArray) [0]
US ANSS [0]
UUSS (Uni. Utah) [0]
2004 04

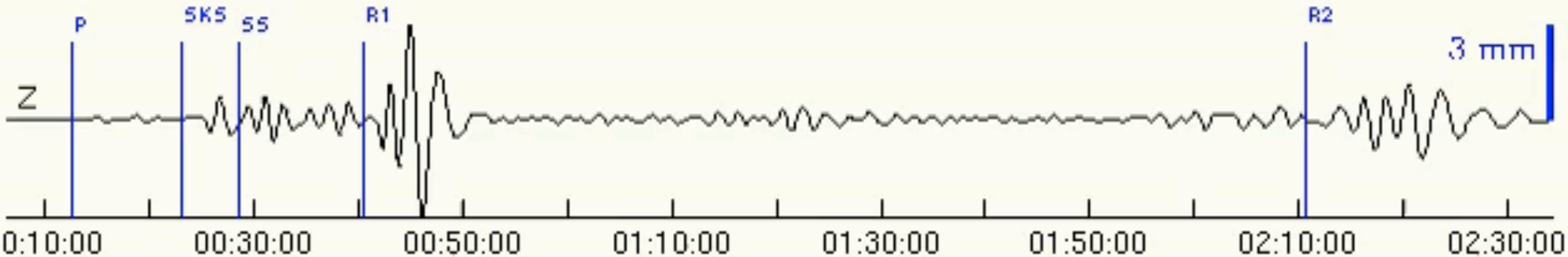


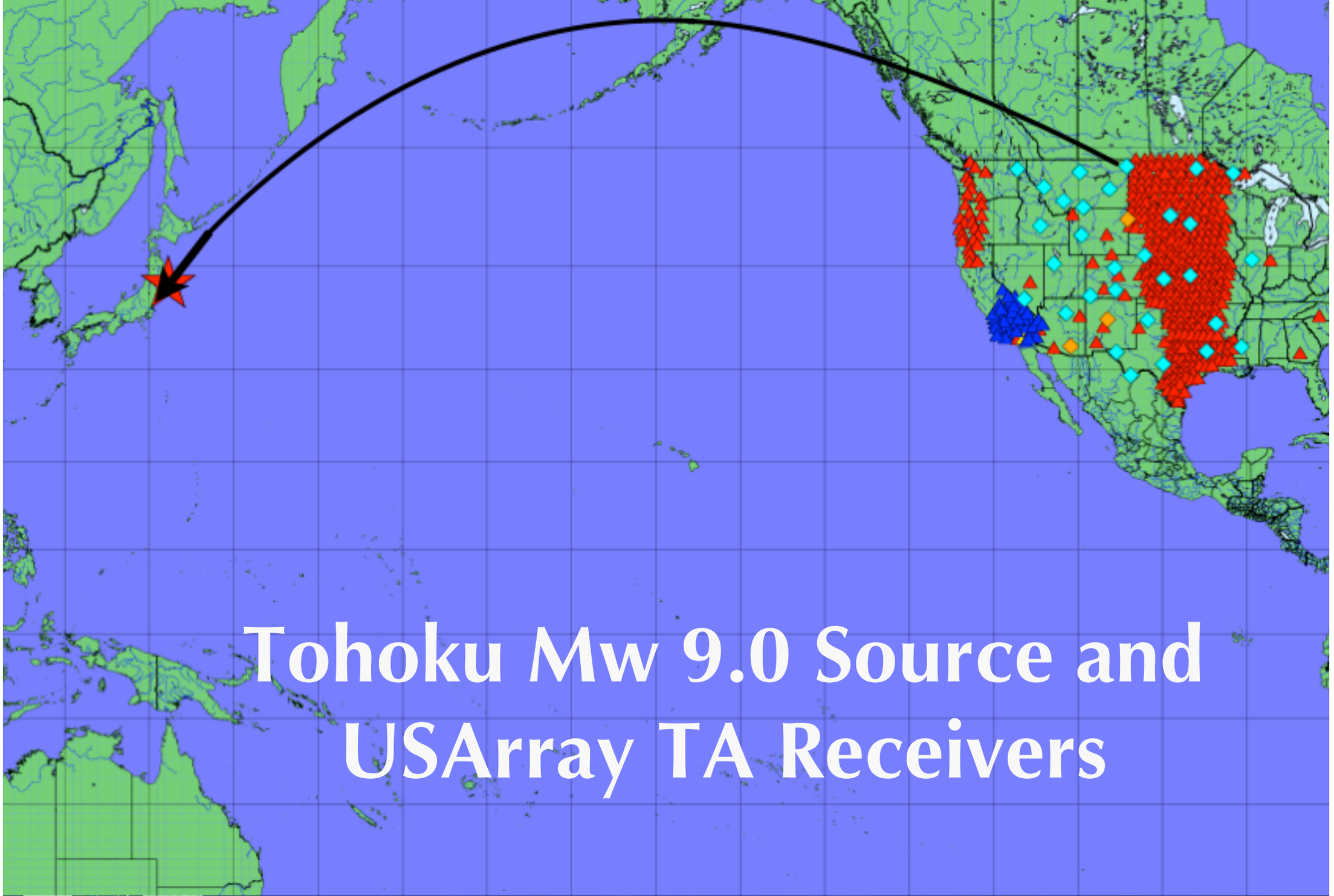
Tohoku Mw 9.0 Source and USArray TA Receivers

March 11, 2011, NEAR EAST COAST OF HONSHU, JAPAN, M=8.9

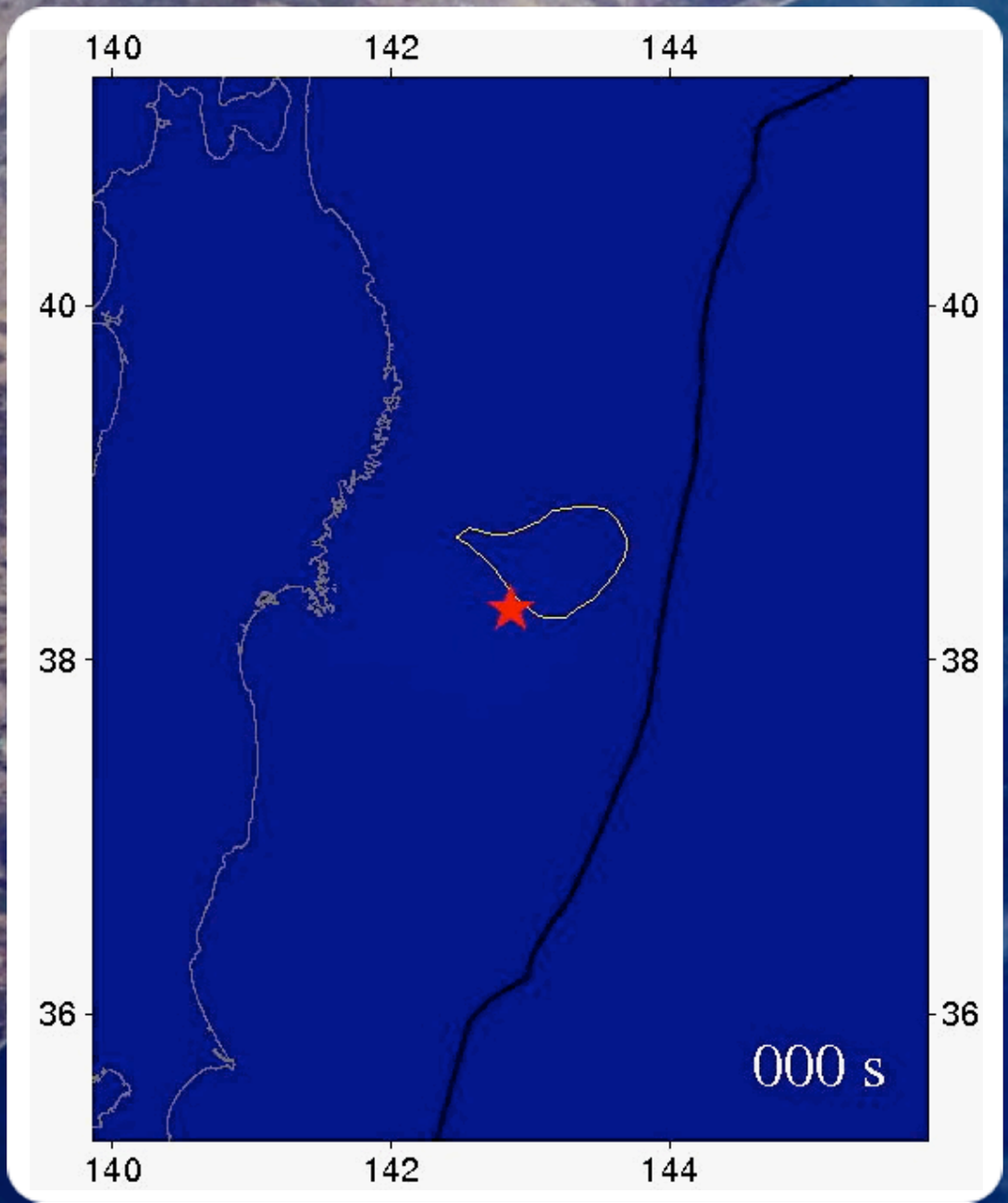


2011/03/11 05:52:35 UTC (372 s) Distance 85.0°/9452 km Azimuth 42.7° Reference Q33A





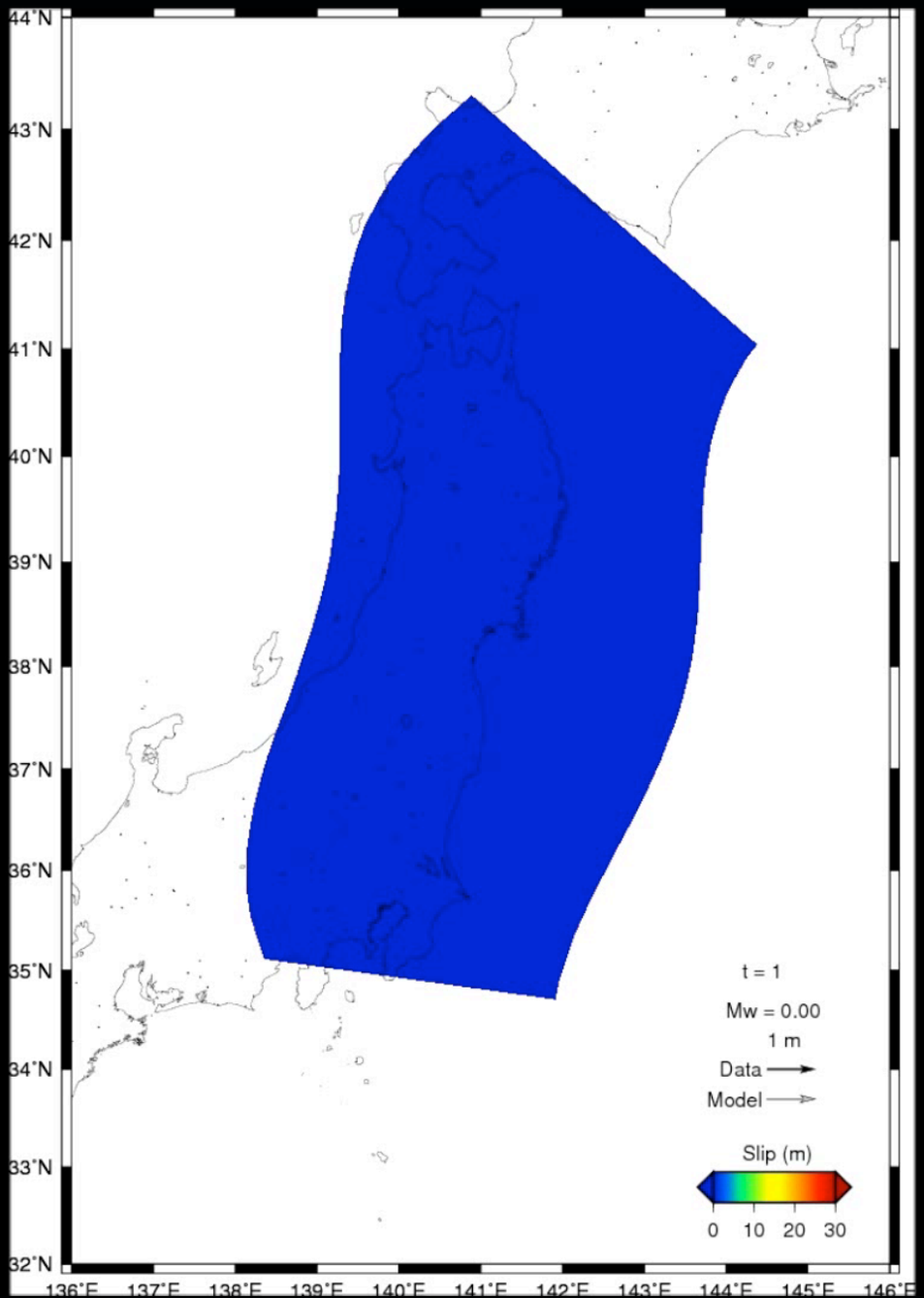
Tohoku Mw 9.0 Source and USArray TA Receivers



Back projection rupture image of the 11 March 2011 Mw 9.0 Tohoku-Chiho Taiheiyo-Oki Earthquake

Kiser and Ishii, 2011

www.seismology.harvard.edu/research_japan.html



Tsunami detection using permanent, real-time GPS

Horizontal Displacements from Tohuku Earthquake - thanks to Japan's GEONET

Real-time inversion of GPS data for finite fault modeling and rapid hazard assessment, *Geophysical Research Letters,* In Press

Brendan Crowell, Yehuda Bock

Advances in Detection and Forecasting alone do not save lives and property

Meeting the challenges posed by a tsunami that reaches the shore in a few hours or less will require persistent progress in risk assessment, education and preparedness, threat detection, and warning management.

Threat Detection

OCEAN OBSERVATORIES INITIATIVE

Commercial Seafloor Cable Opp[illegible]ities

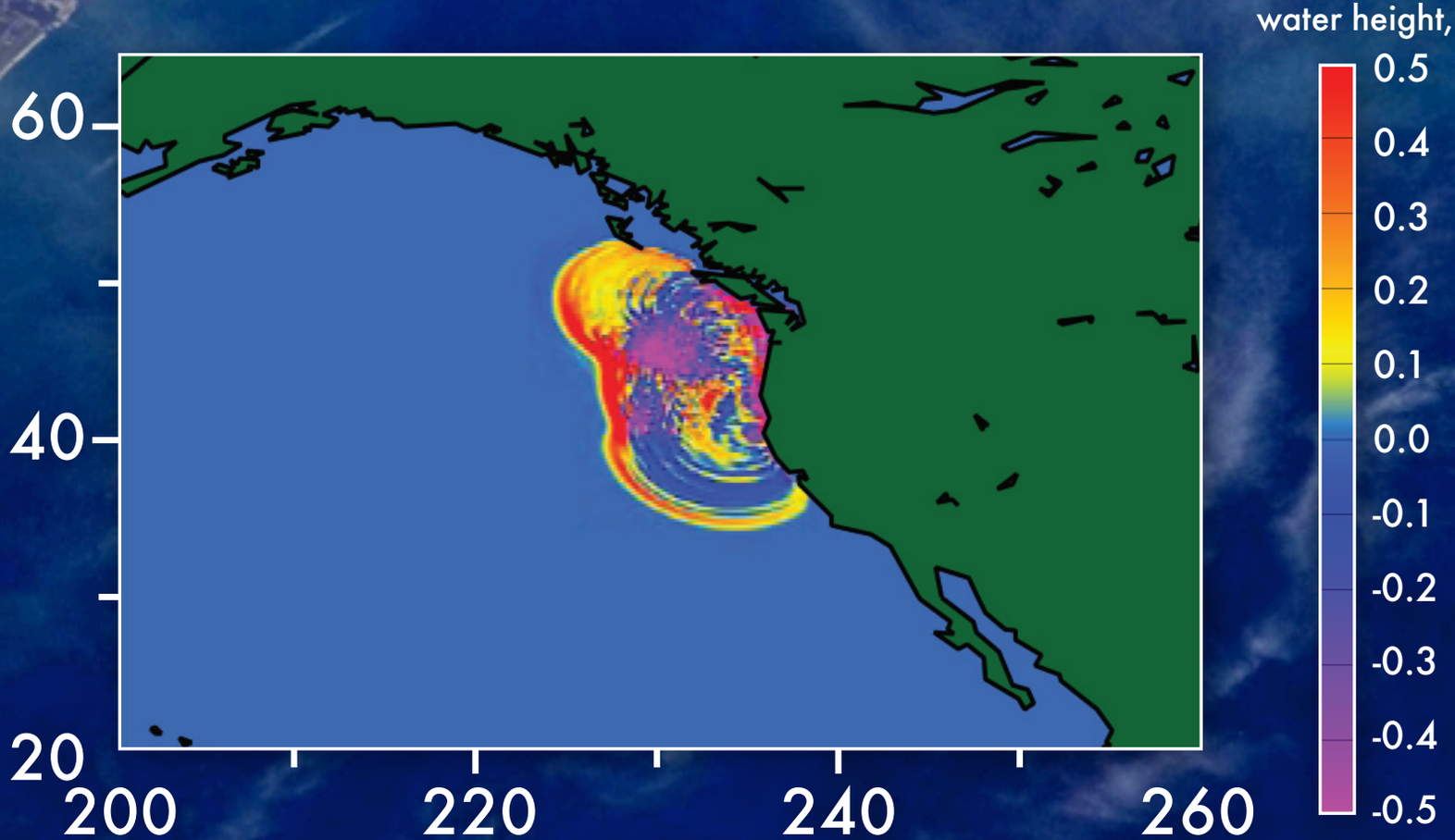
Partnership

TE SubCom

Scripps/UCSD

PMEL/NOAA

Threat Detection



Promising New Technologies & Research

- Cabled observatories such as NEPTUNE-Canada and the NSF OOI RSN for tsunami warning;
- Continuous GPS near the shoreline for measuring moment and predicting tsunami generation;
- High-frequency P-waves (seismology) and ocean acoustics for mapping the extent of the source
- Observations of tsunami wave trains from satellite altimetry
- Detection of tsunami waves from seismometers on islands
- GPS satellite detection of the upward continuation of tsunami waves in the ionosphere using

Promising New Technologies & Research

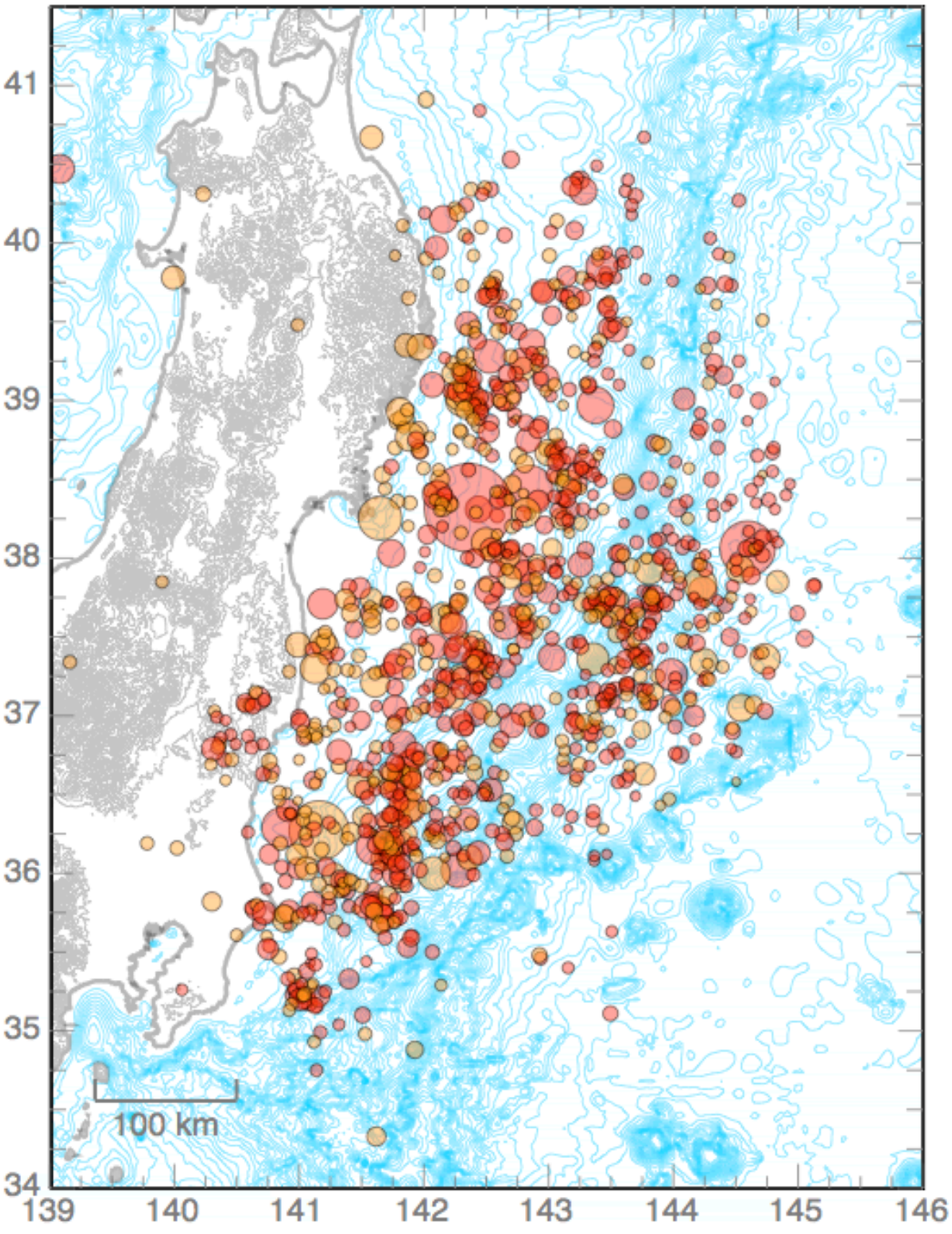
Post tsunami event reconnaissance are important to:

- Validate forecast and inundation models;
- Estimate the tsunami source, flow speeds, and flow effects on infrastructure;
- Evaluate social impacts, the effectiveness of education and outreach, and how well the warning system worked;
- Assess effectiveness in communication and coordination of the response;

Recommendation: Tsunami field surveys should be conducted by multi-disciplinary personnel including physical and social scientists, engineers, disaster-mitigation planners, and sociologists. NOAA should take a more proactive role in the coordination for tsunami surveys with other agencies, in particular USGS and NSF.

In Conclusion

- Progress has been made
- Many issues need to be resolved to meet the challenge posed by a tsunami that might arrive in just a few hours or less
- Develop and maintain the momentum for modernization
- Need to find the appropriate balance in allocating resources to meet this challenge



Tohoku Mw 9.0 Source

- One hour time steps
- Fade after 1 week
- Animation by C. J. Ammon, Penn State
- Data from the US Geological Survey.

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