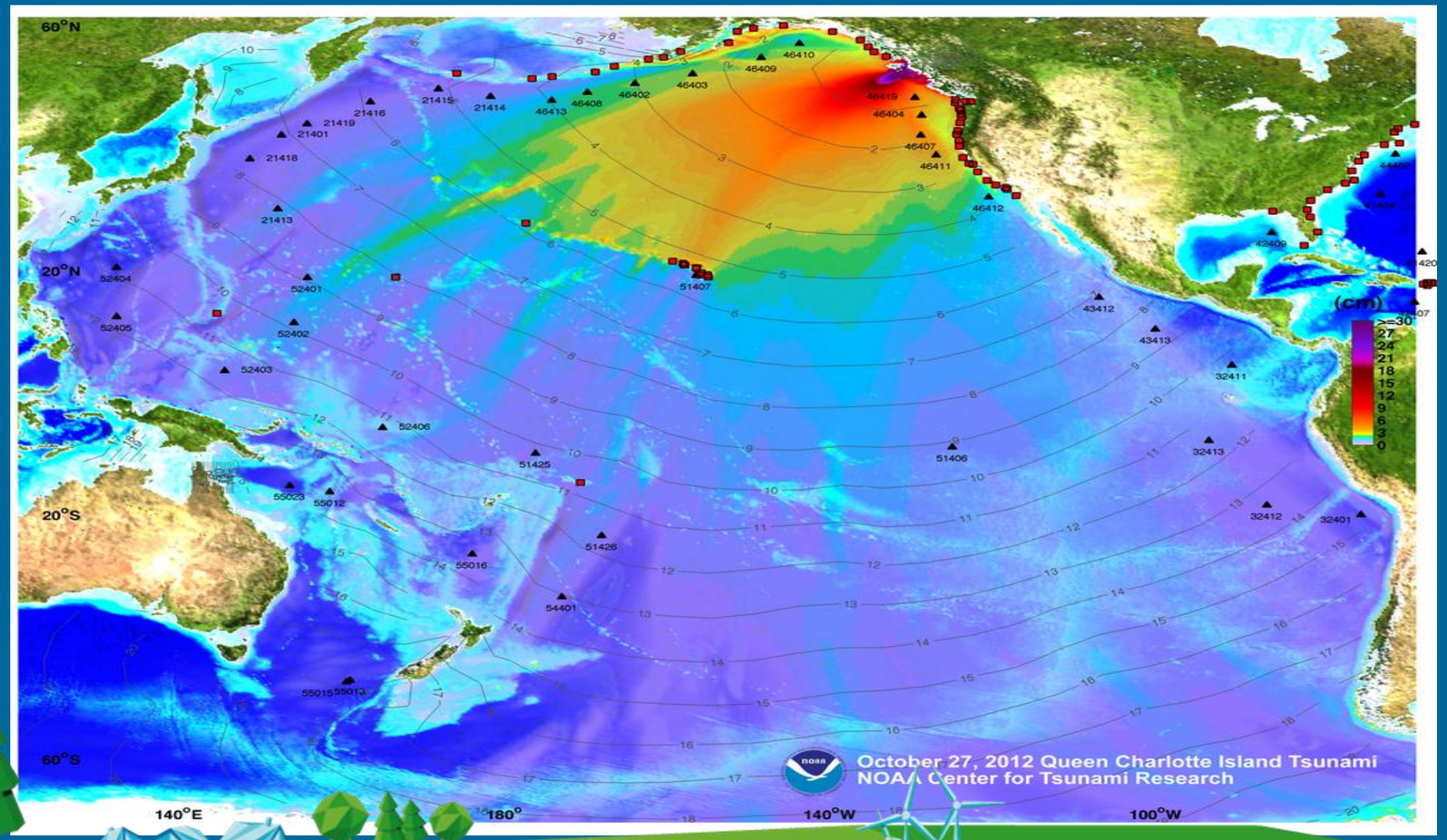
ITU Green standards week

Innovating today for a sustainable tomorrow_

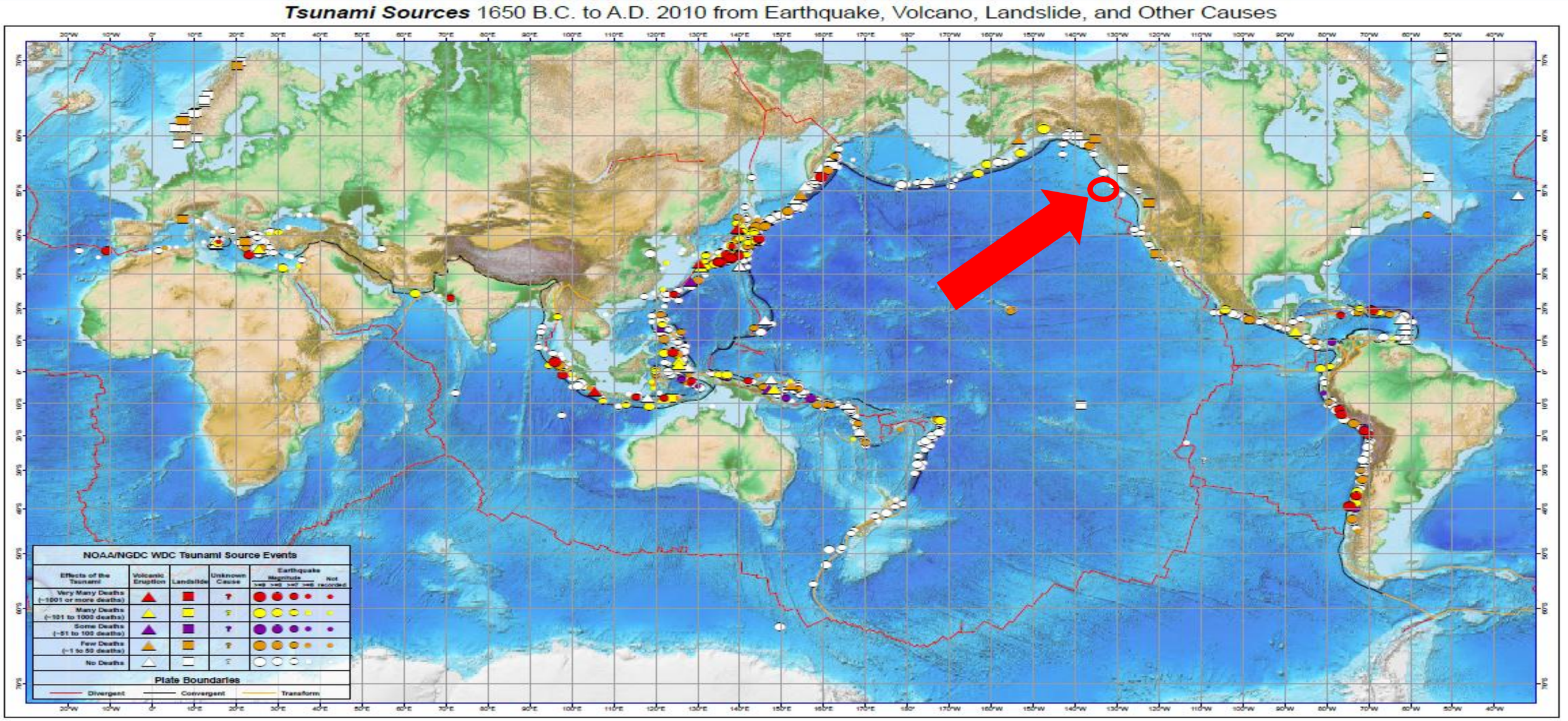
Preliminary Ideas on Sensor Configurations and Challenges for the Green Cables

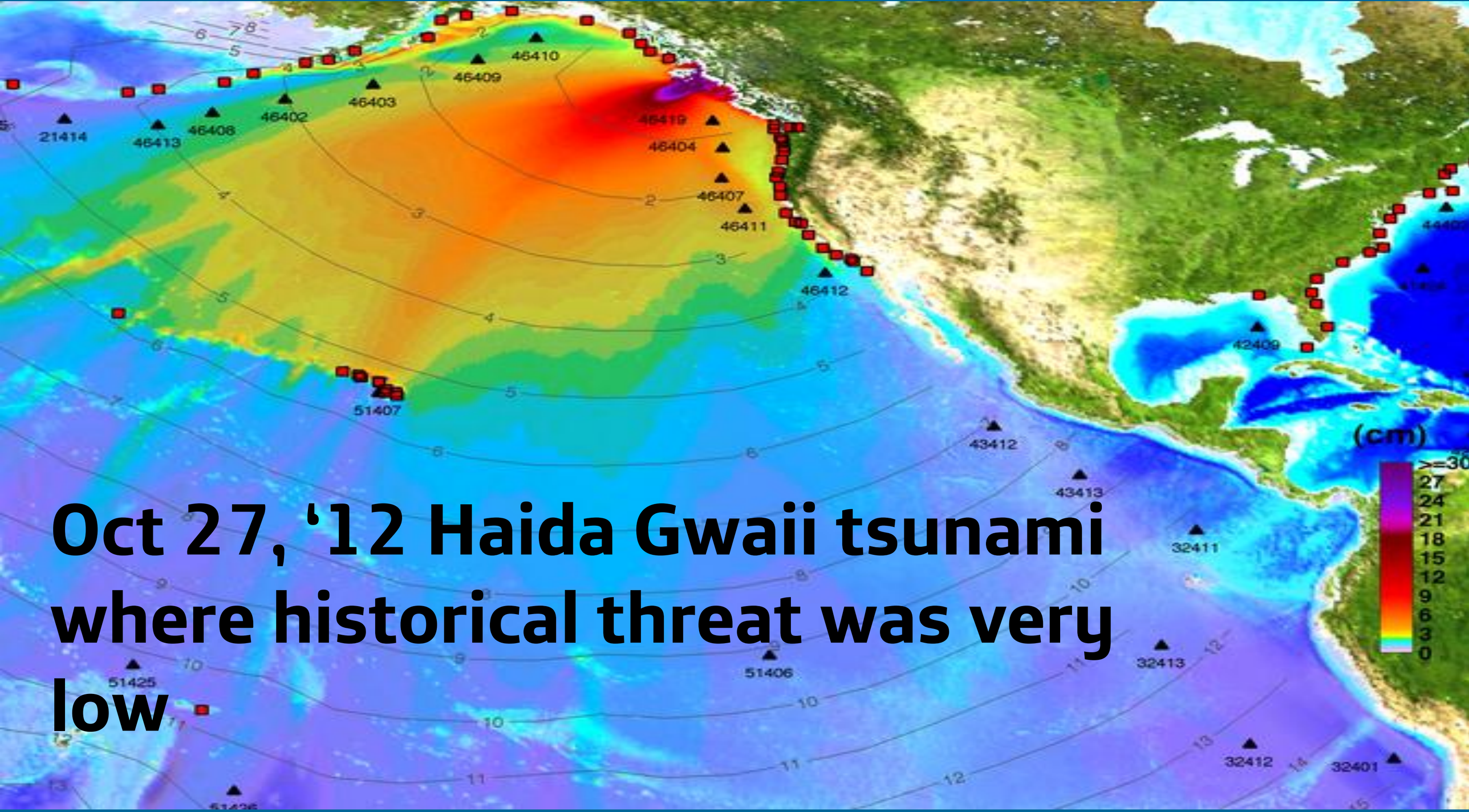
Christian Meinig

Christian Meinig,
NOAA Pacific Marine Environmental Lab
Seattle, WA



Historical Tsunamis



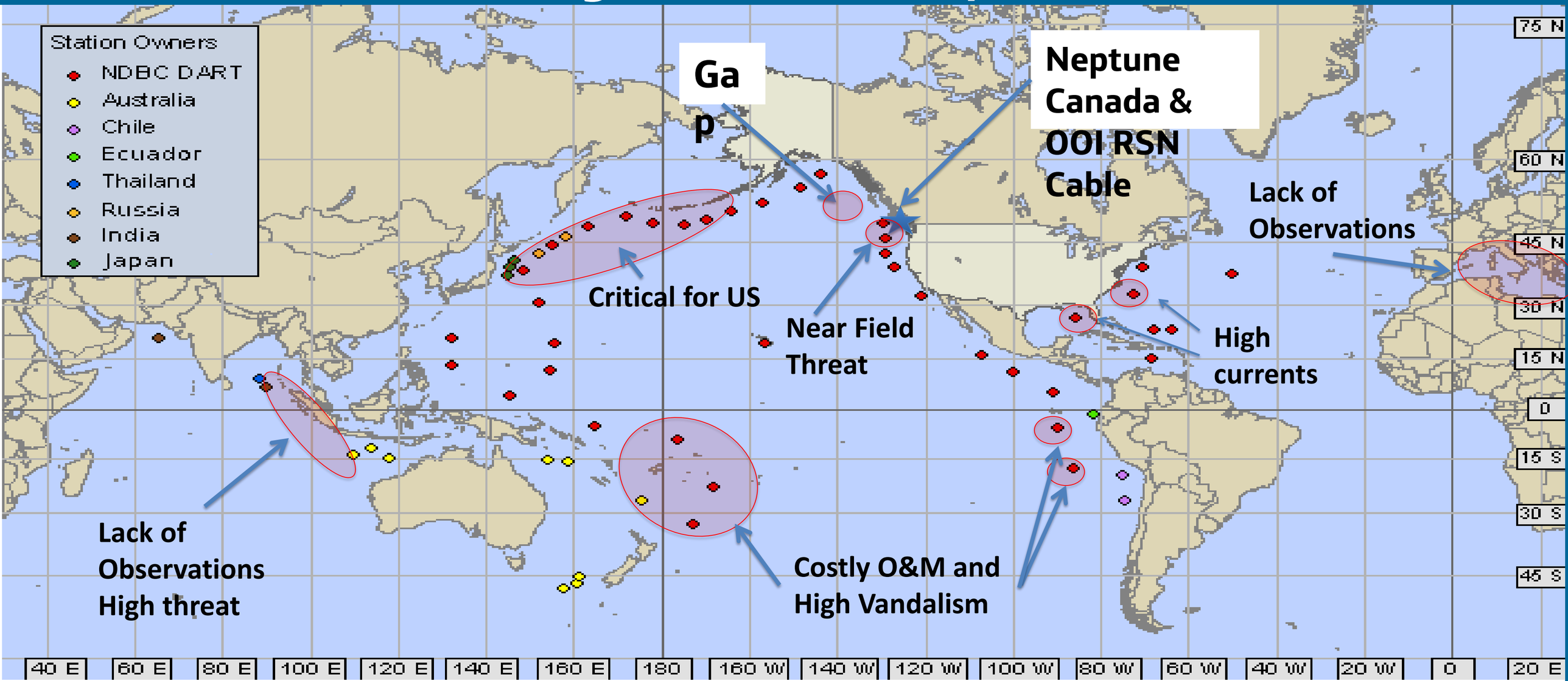


Oct 27, ‘12 Haida Gwaii tsunami where historical threat was very low

Topics

- Background
- Sensing Configurations(for discussion)
- Challenges
- Next Steps

Additional Observations are Needed
Array Status: Sept'13



Tsunami Forecasting Requirements: Other Technology

(Bernard & Meinig 2011)

TABLE I. COMPARISON OF REQUIREMENTS FOR TSUNAMI FORECASTING WITH TECHNOLOGIES. BLUE CHECK INDICATES MEETING REQUIREMENT, WHILE X INDICATES NOT MEETING REQUIREMENT

Tech / Criter	Type	Accuracy	Rate	Processing	Availability
DART	✓	✓	✓	✓	✓
GPS Buoy	✓	×	✓	✓	×
CODAR	×	×	×	×	×
Sat. Altimeter	✓	×	✓	×	×
Sat.Scatt.	×	×	×	×	×
ADCP	×	×	×	×	×
E/M voltage	×	×	×	×	×
Acoustic	×	×	✓	×	×
Cabled BPR	✓	✓	✓	✓	×

DART Tsunami Siting Parameters

(from Spillane et al 2008)

- Tsunami travel times from potential tsunami sources
- Positions relative to tsunami propagation paths to U.S. impact sites
- Suitability of location for hardware deployment (currents, bathymetry)
- Avoidance of wave scattering islands, seamounts, and ridges
- Location relative to political boundaries

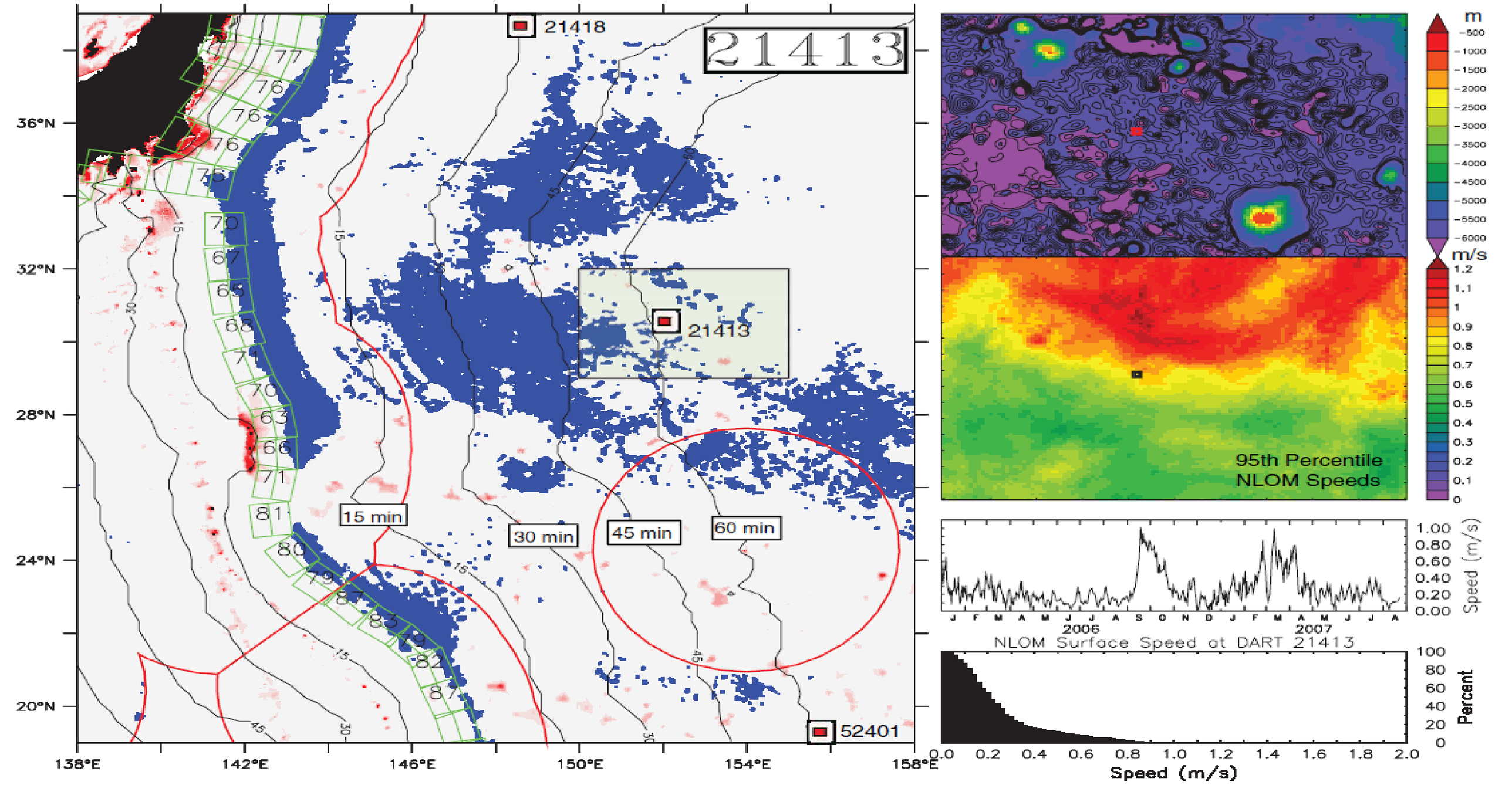
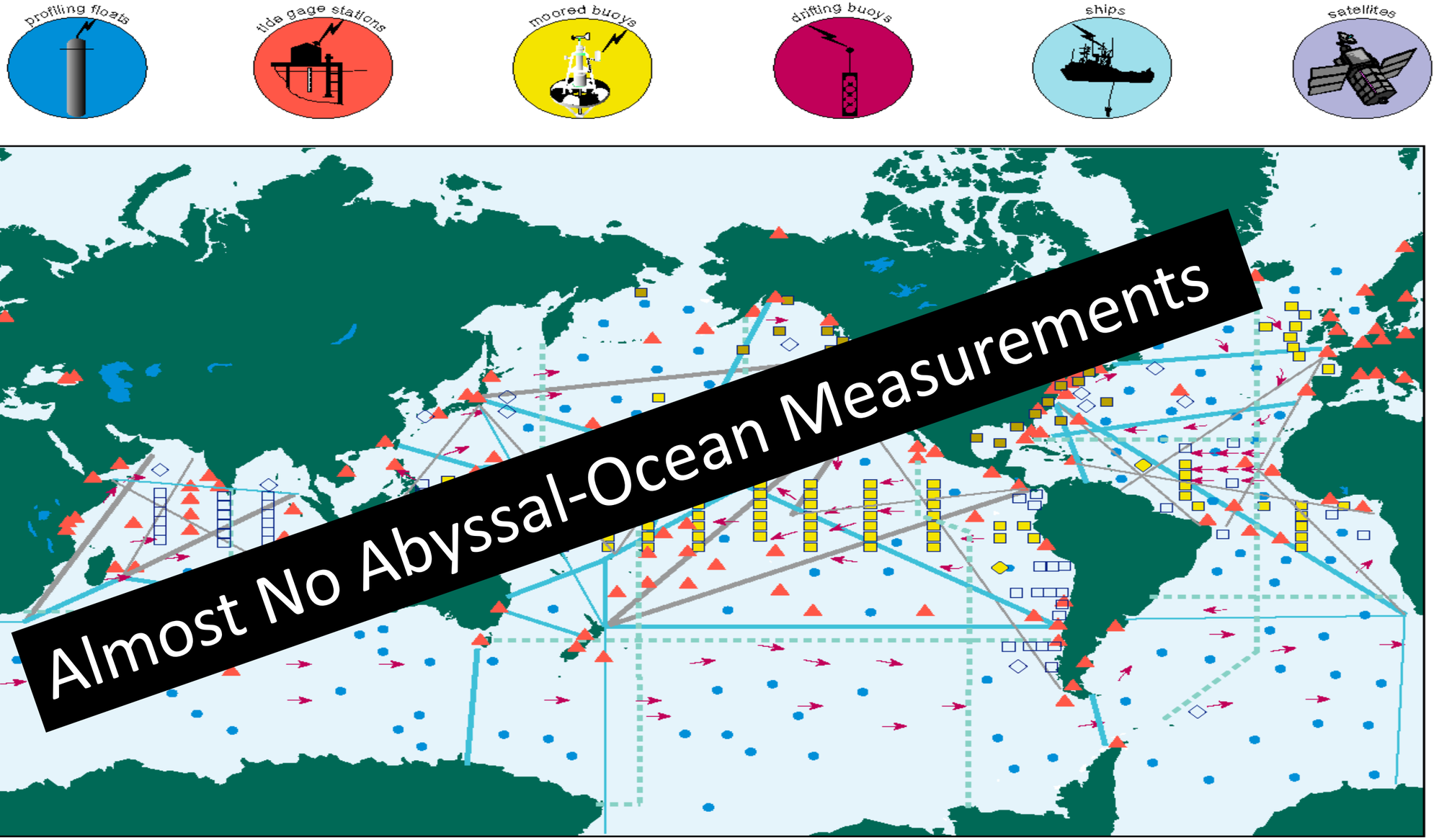


Figure 7: Siting environment for DART® 21413 in the Western Pacific.

Global Ocean Observing System for Climate and Marine Services



Sensing

From Science & Society Committee's draft report

- Climate Variability: Bottom Pressure, Temperature
- Tsunami: Bottom Pressure
- Seismicity/Tsunami: Bottom Pressure, Accelerometer*

*Additional interest in hydrophones, but not main part of report

Range, Accuracy, Sampling Rate (draft)

Science & Society Measurements

Range, Accuracy, Sampling Rate-Interpreted by Meinig

	Climate Variability			**Tsunami**			**Seismology/Tsunami**		
	Range	Accuracy	Rate	Range	Accuracy	Rate	Range	Accuracy	Rate
Bottom Pressure	0-7000m	<mm	<60min	0-7000m	<mm	10-40Hz	0-7000m	<mm	10-100Hz
Bottom Temperature	-5 to 20 C	<mC	<10min	N/A			N/A		
Accelerometer	N/A			See Seismic			~136dB	>24bit	2kHz
Time		<minute			<second			<ms	

Drift per Year (draft)

Science & Society Measurements

Drift Uncertainty/year-Interpreted by Meinig

	Climate Variability	**Tsunami**	**Seismology/Tsunami**
	drift/yr	drift/yr	drift/yr
Bottom Pressure	?	<1m	<1cm
Bottom Temperature	<0.5mC	N/A	N/A
Accelerometer	N/A	N/A	?
Time	<minute	~second	<millisecond

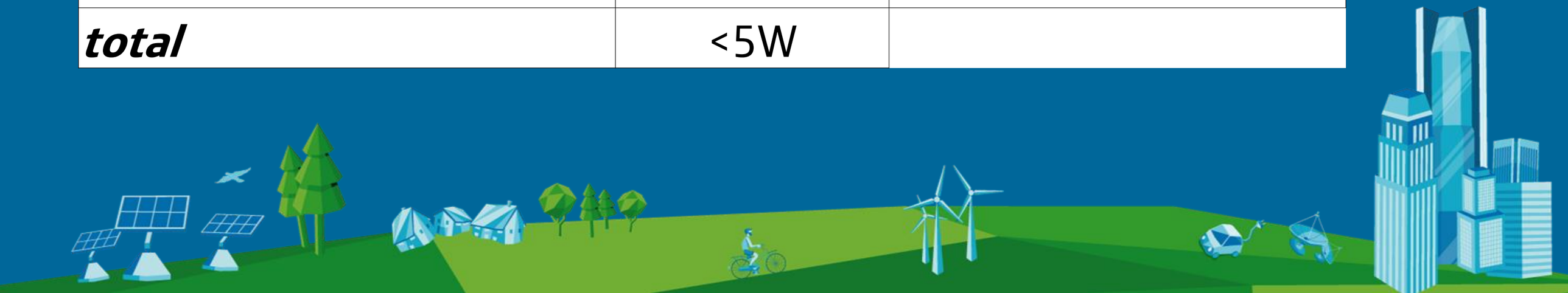
Data Rates (draft)

	Data Rate (kbps)	Digital
Bottom Pressure	1	y
Bottom Temperature	0.05	y
Accelerometer*	64	n
Overhead	4	y
total	<70 kbps	

*(for Silicon Audio Geolight 32bits/sample x 2kHz rate)-verbal Charlie Thompson

Power (draft)

	Power (W)	
Bottom Pressure	0.3	
Bottom Temperature	0.2	
Accelerometer	0.075	(25mW/channel)
-Accelerometer Digitizer	2?	
Overhead	?	
total	<5W	



Challenges

- Funding, Funding, Funding
- Balancing Sensing Scope and Chances of Launch
- Strategy?

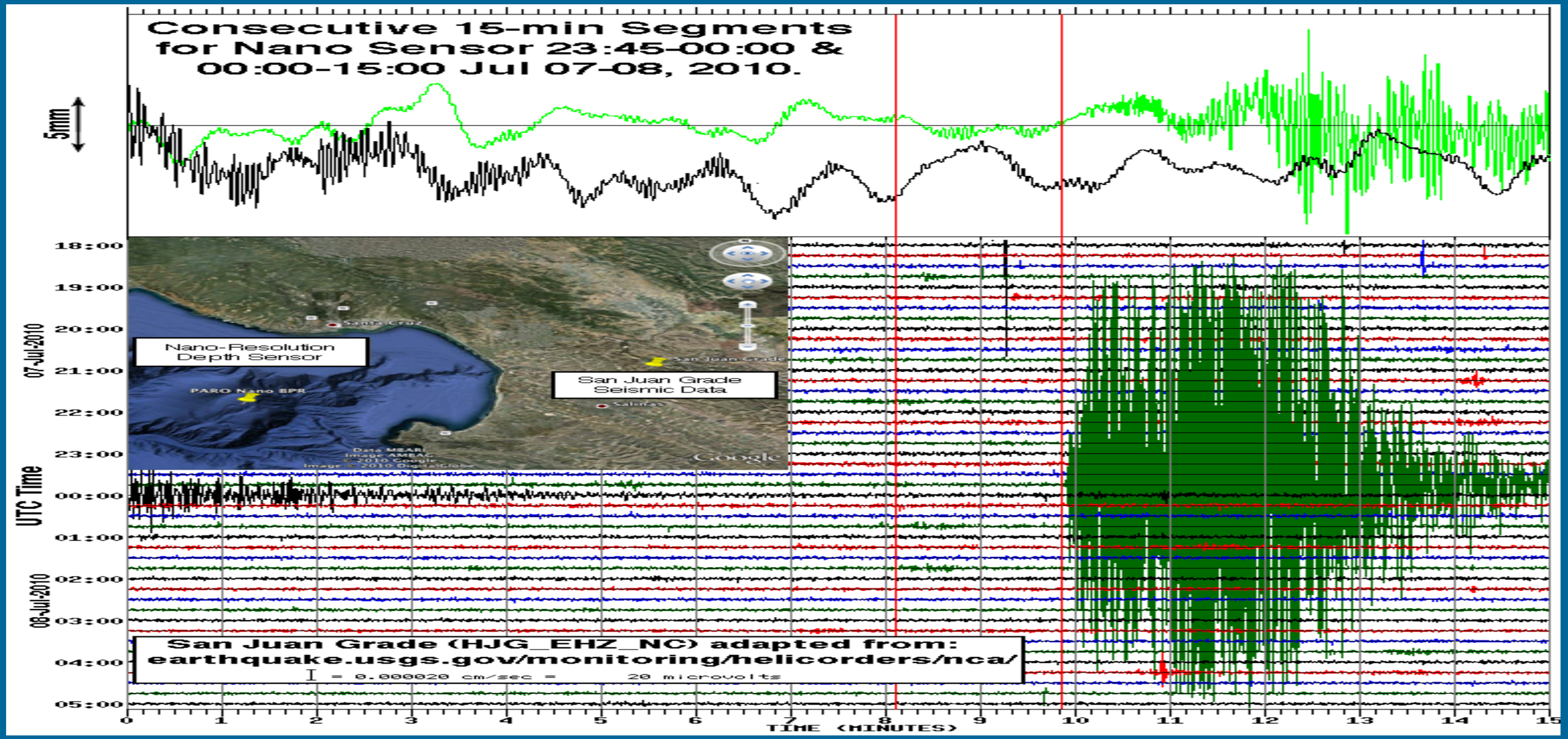
Summary

- Strong societal & scientific benefits to monitoring the abyssal ocean
- Cost-effective in-situ observations will be needed for ~decades
- Next Step: Functional Requirements Document
- Strategy: Start simple….but ‘start’

Thank you
questions?

Extra slides

1.5 Year of Data, numerous EQs and tsunamis recorded



Nano-resolution Depth Sensor & Land-based Seismometer Comparison

From (Paros, Chadwick Meinig, et al 2012)