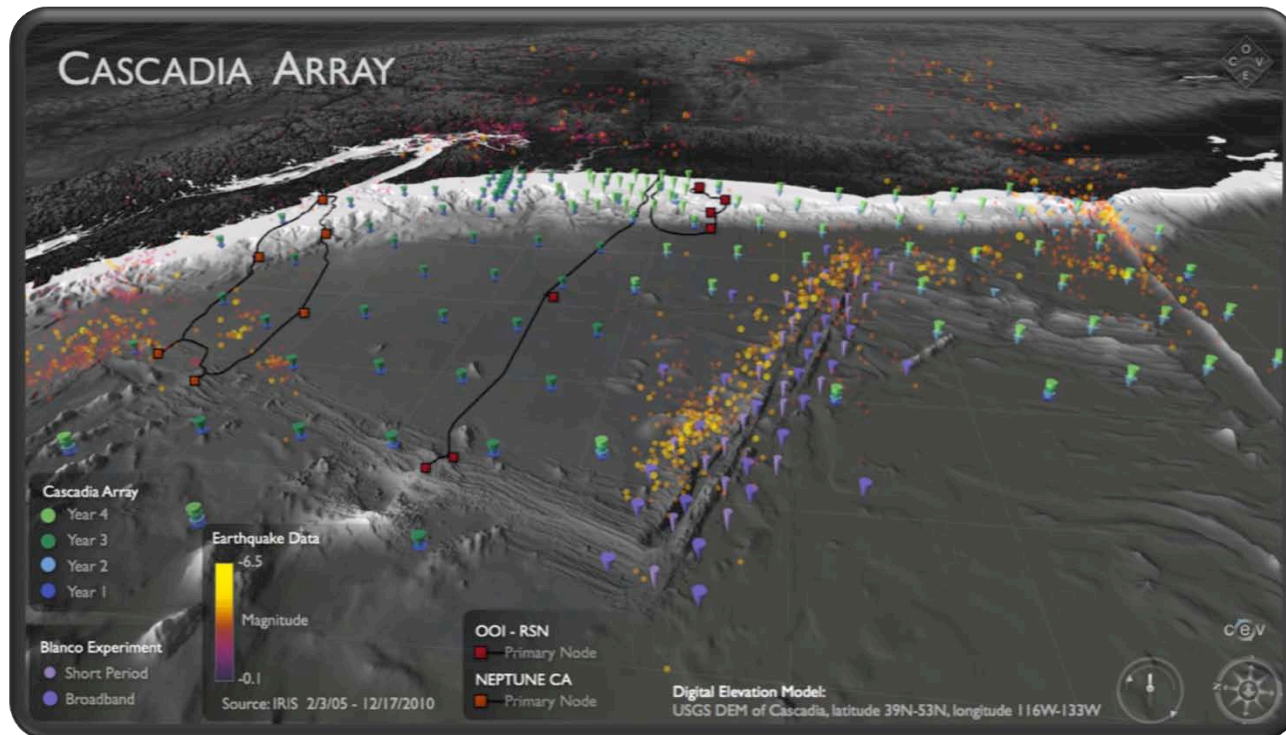


# Status of the Ocean Bottom Seismology Component of the Cascadia Initiative



Douglas R. Toomey, Richard M. Allen, John A. Collins, Robert P. Dziak, Emilie E. Hooft, Dean Livelybrooks, Jeffrey J. McGuire, Susan Y. Schwartz, Maya Tolstoy, Anne M. Trehu, William S. Wilcock

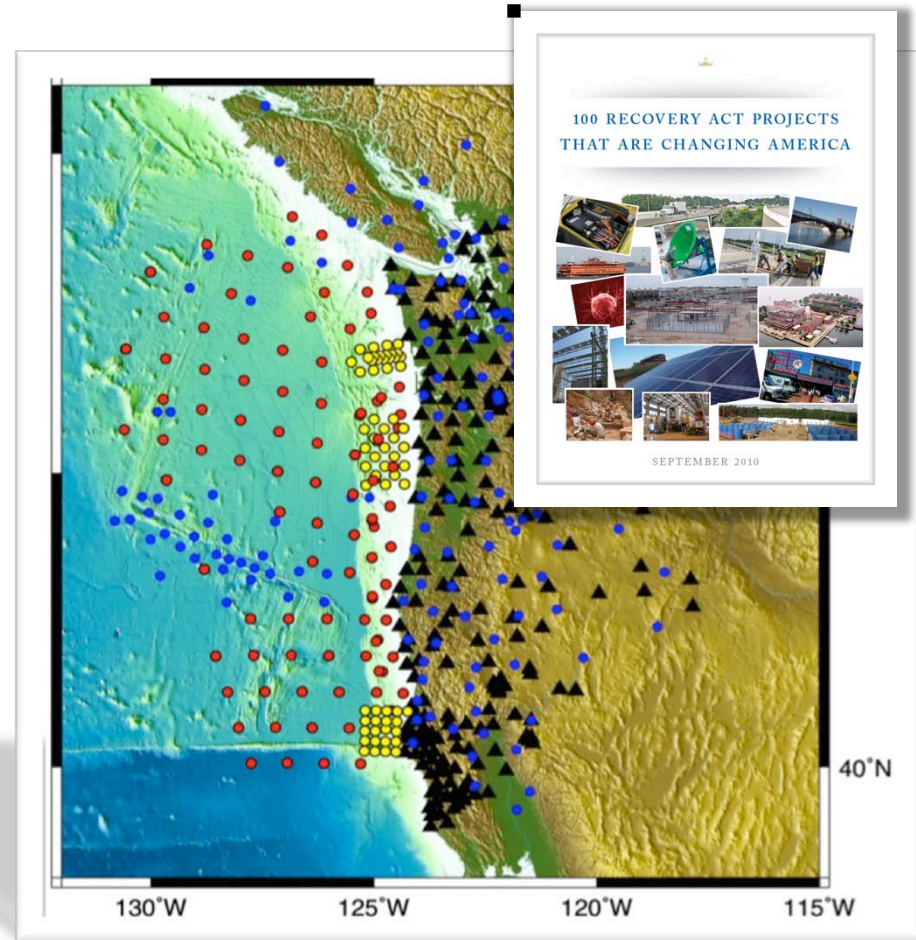


Supported by the National Science Foundation

# Cascadia Initiative Facilities

Obtain high quality data across the shoreline that includes the plate boundaries.

- GPS: 232 high rate sites
- Onshore seismic stations: 27 broadband and accelerometer sites
- Ocean bottom seismometers: 60 new ARRA OBS from OBSIP & 10 Keck OBS.



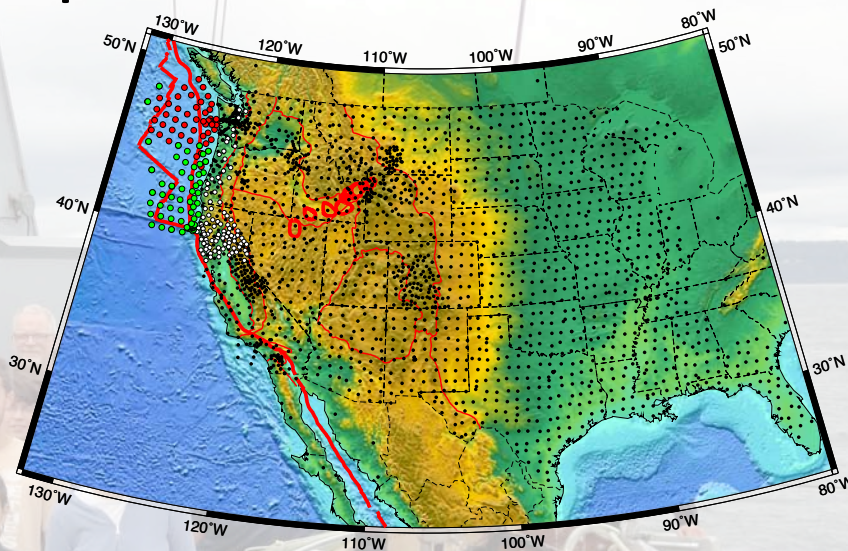
# The Cascadia Initiative is a Community Experiment

- Deployment plan developed by an NSF-funded community workshop (Portland, 2010)
- Data openly available to all via the IRIS DMC
- Amphibious Array Steering Committee (AASC)
  - Facility oversight
- Cascadia Initiative Expedition Team (CIET)
  - Implementation



# Advantages of a Community Experiment

- Scientifically ambitious
  - Capable of doing more experimentally than a PI driven experiment
- Wider use of data
  - All users have immediate access to data
  - Better science
  - Cost effective
- Attracts new users
  - Younger scientists want accessible opportunities
  - A vibrant community also attracts younger scientists

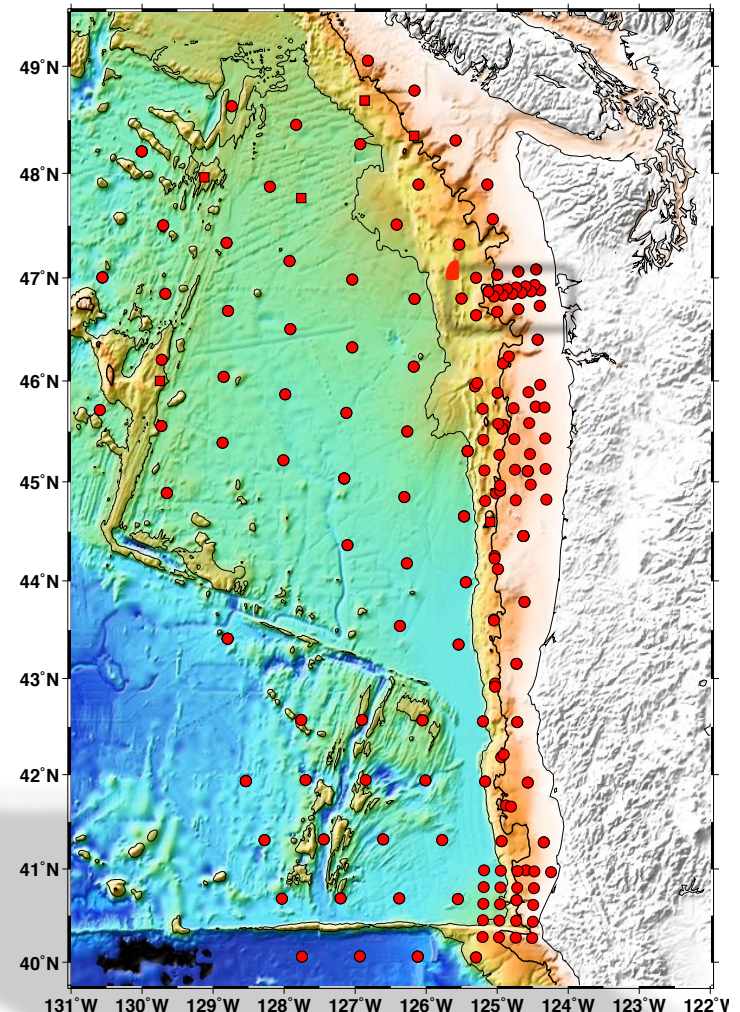


# Cascadia Initiative is planned as a 4 year experiment

## Multi-scale array with several components

- Regional/Transportable array
  - Plate scale imaging
- Monitoring array
  - Nominal station spacing of 35 km along the thrust
- 3 focused experiments
  - Grays Harbor (2011/2013)
  - Mendocino Triple Junction (2012)
  - Central Oregon segment boundary (2014)

Cascadia Design



# The CI leverages resources of other facilities and PI- and community-driven experiments

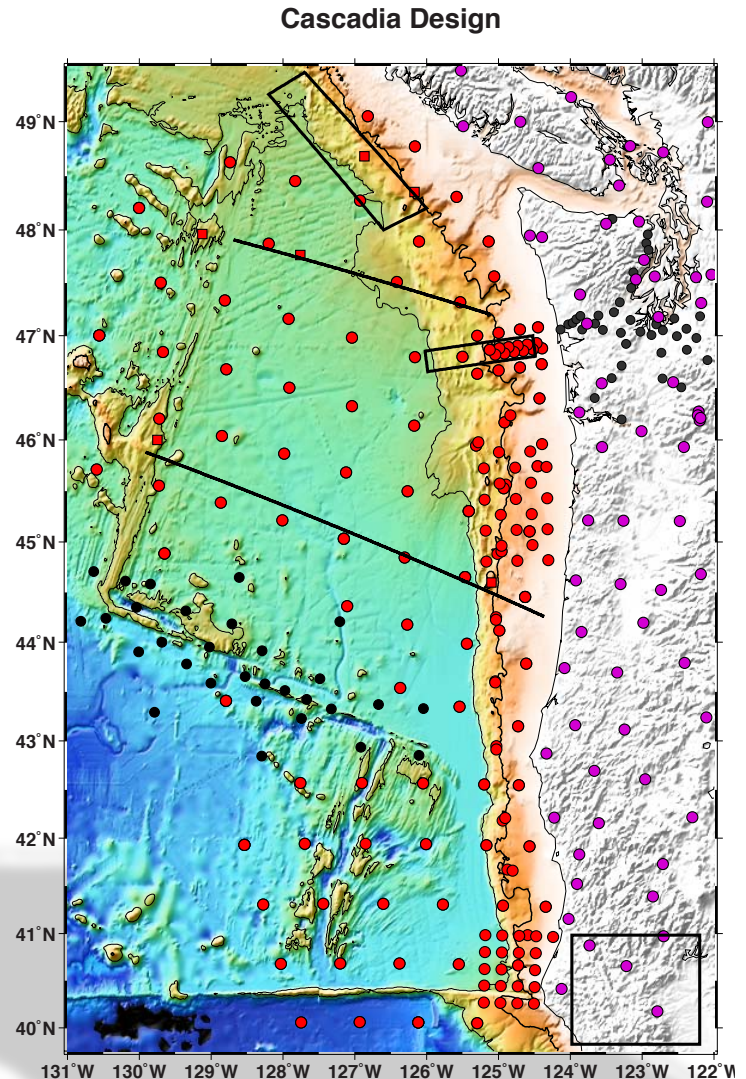
## Synergies & high resolution studies

- NEPTUNE Canada & OOI
- 2 MCS and refraction studies
  - Carbotte/Canales
  - Holbrook and others
- CAFÉ experiment

## Broadband and short-period studies:

- Accretionary prism: SeaJade
  - McGuire, Wang and others
- Blanco transform
  - Nabelek/Braunmiller
- Mendocino triple junction on land

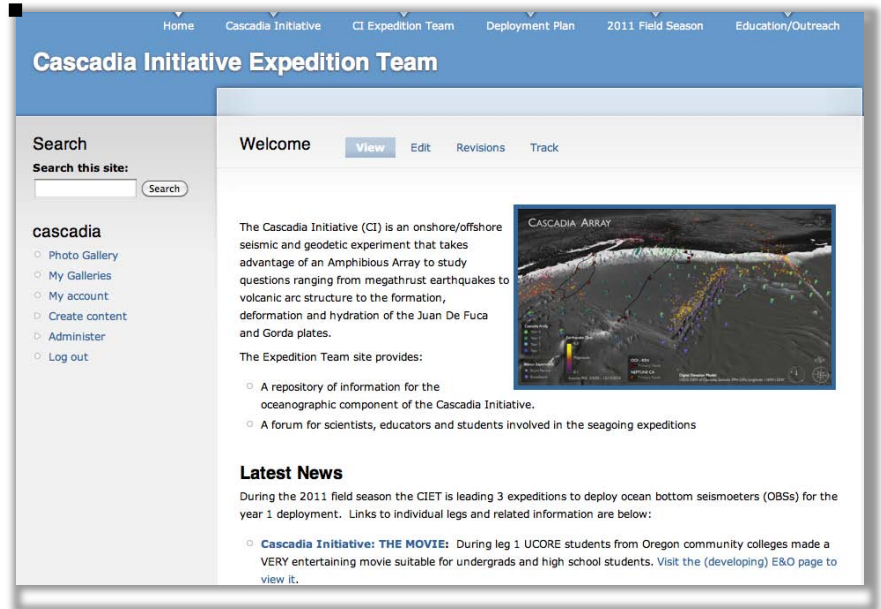
- Over 400 OBS deployments



# Cascadia Initiative Expedition Team (CIET)

## CIET

- Implementing the oceanographic component of the deployment plan developed at the Portland workshop
- Lead expeditions to deploy and recover CI OBSs
- Develop Education and Outreach modules
- Knowledgeable about the science and operational objectives
- Individuals with chief scientist experience and ones who have not yet been to sea
- representatives from both the EAR and OCE communities

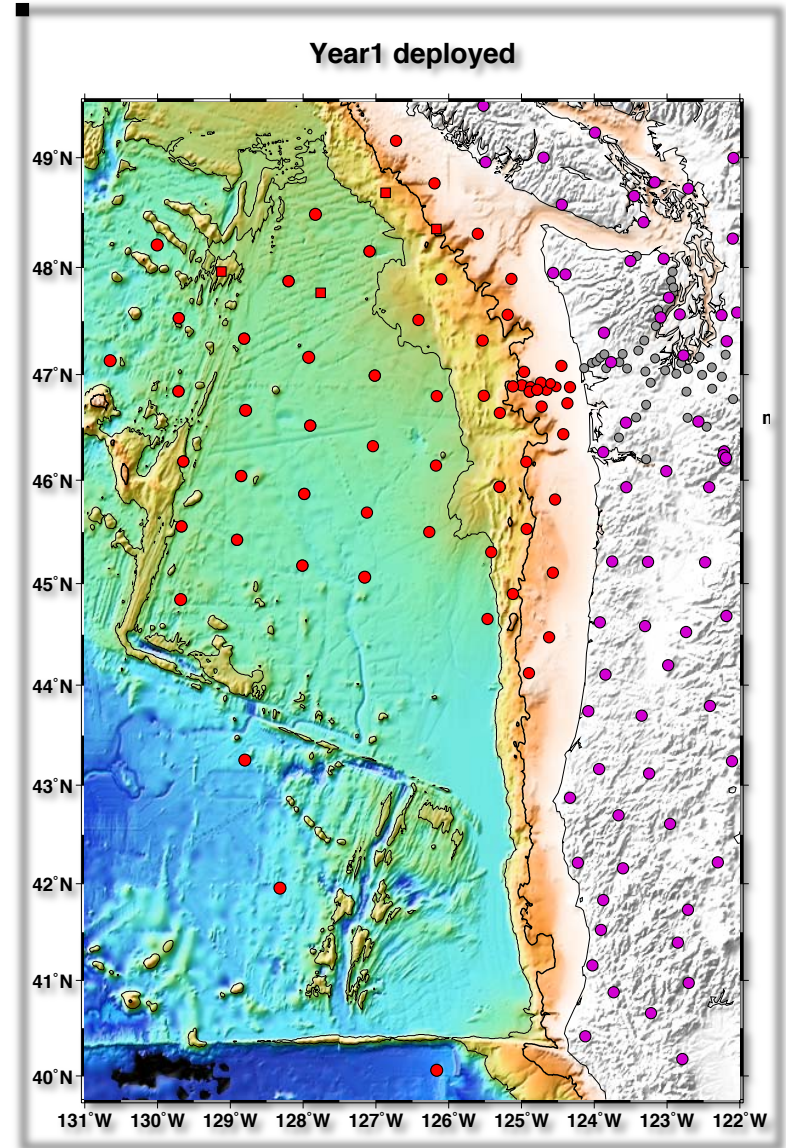


<http://cascadia.uoregon.edu>

# 2011 Field Operations

Deployed 62 OBSs, including

- Northern Focused Array at Grays Harbor
- Northern transportable array
- Reference array
- All instruments recovered in 2012



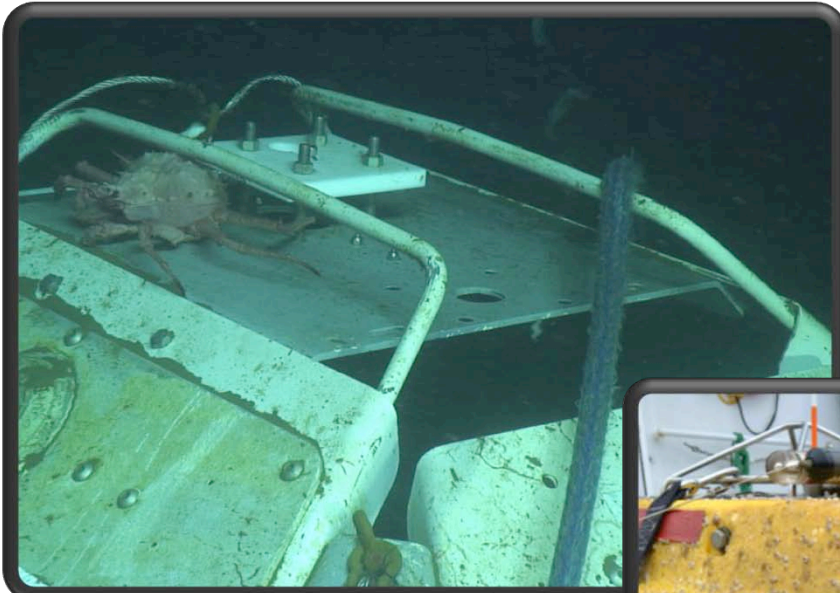


# R/V Wecoma, Thanksgiving 2011

(It's final voyage)



# Shallow water deployments bring challenges



Crab Perch



Fish Habitat



Biofouling

# Shallow water deployments bring challenges

TRMs as habitats

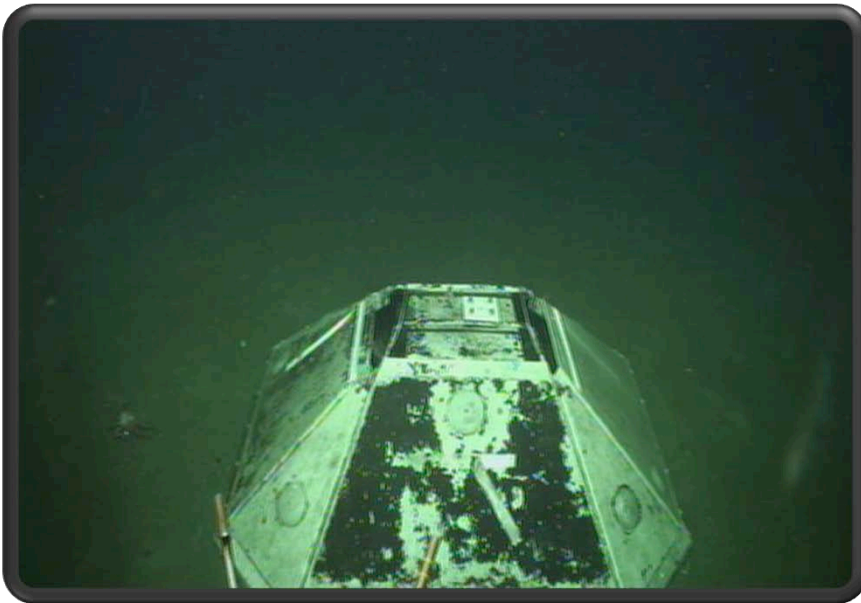


Deployment w/o Heave Compensation



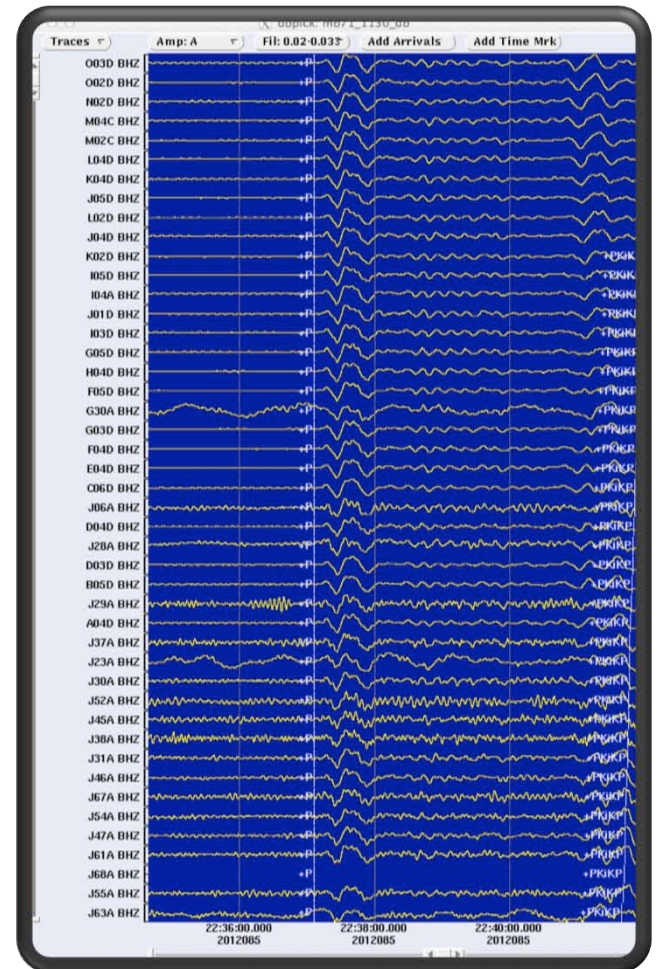
Find the OBS

# Trawl Resistance Proves Useful



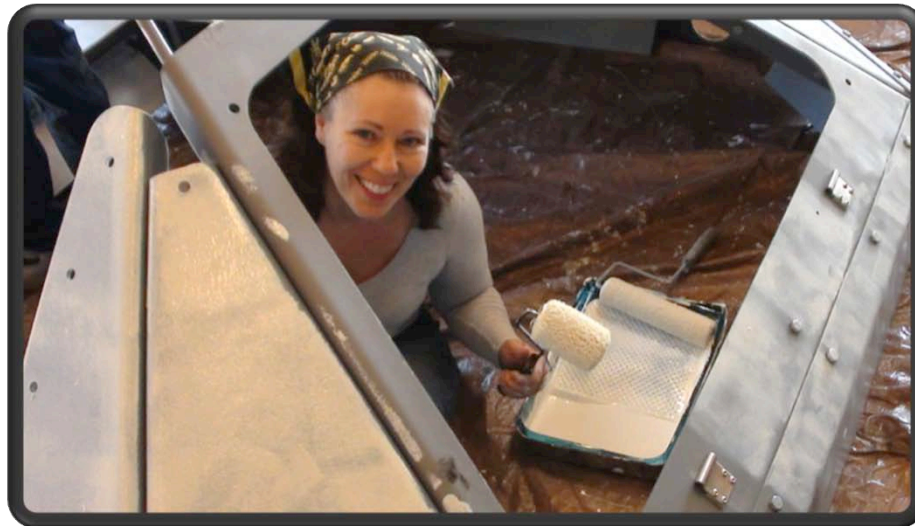
**FN12A** Oriented with respect to Jason's heading (left) which was 286 (perpendicular to the bails). Note the peeling reflective tape, perhaps indicative that the instrument was hit by a trawler. The frame also showed signs of having been scraped with chips of white paint visible at the base and consistent with directions of trawling marks observed on the sonar.

# Examples of Data



# Performance

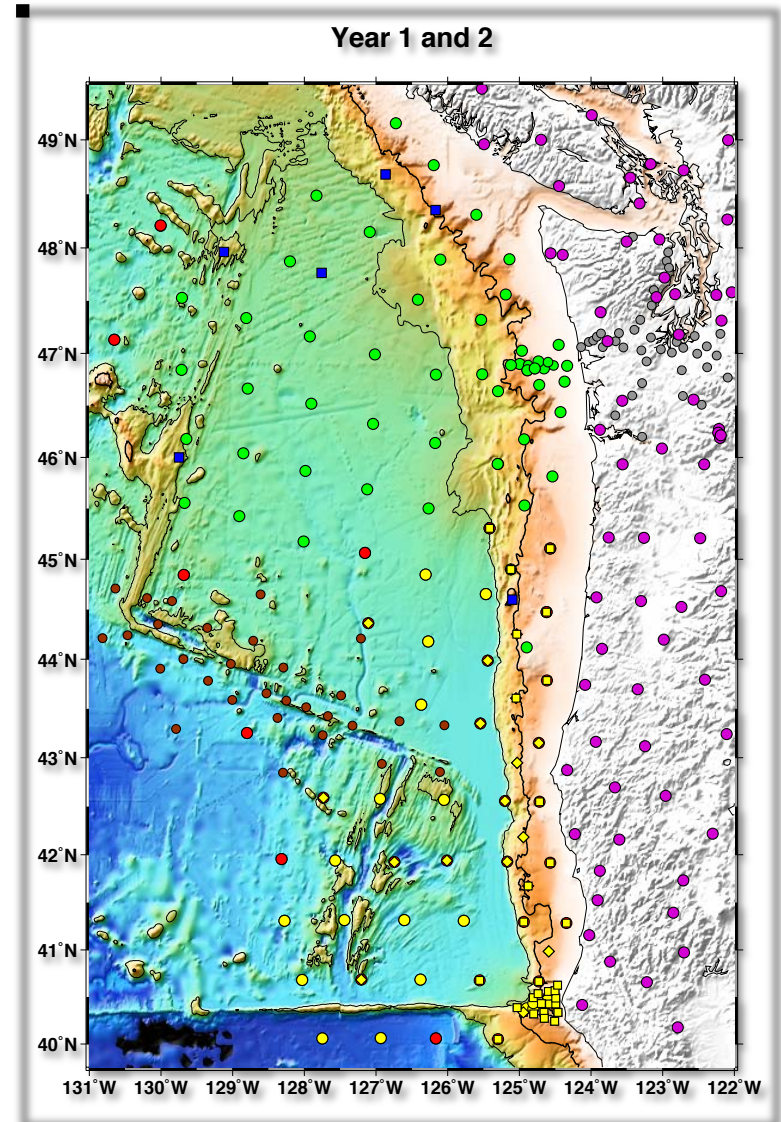
| Group         | # OBS     | OBSs that recorded | # Channels Available | # Channels Recorded | Channel Success | % of Channels in Array | % of Successful Channels in Array | Successful OBSs in Array |
|---------------|-----------|--------------------|----------------------|---------------------|-----------------|------------------------|-----------------------------------|--------------------------|
| LDEO          | 24        | 24                 | 96                   | 70                  | 73%             | 35%                    | 25%                               | 39%                      |
| WHOI          | 23        | 23                 | 122                  | 119                 | 97%             | 44%                    | 43%                               | 37%                      |
| SIO           | 15        | 13                 | 60                   | 49                  | 82%             | 22%                    | 18%                               | 21%                      |
| <b>Totals</b> | <b>62</b> | <b>60</b>          | <b>278</b>           | <b>238</b>          |                 | <b>100%</b>            | <b>85%</b>                        | <b>97%</b>               |



# 2012 Field Operations

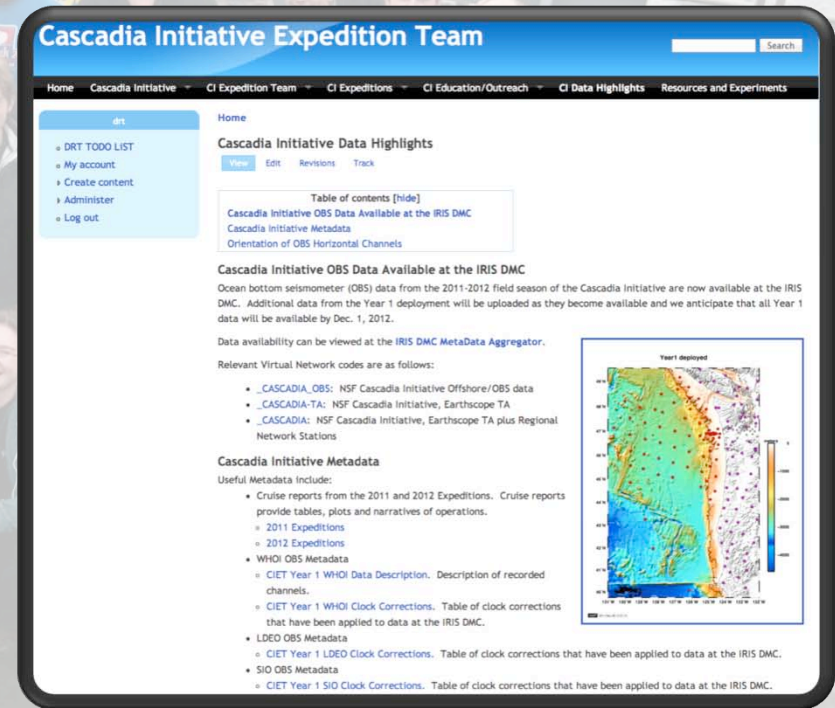
## Objectives:

- Recover instruments deployed in 2011
- Deploy 70 OBSs, including
  - Southern focused array at Cape Mendocino
  - Southern transportable array
  - Reference array
- Operations included six cruises
- CI array will be complemented by a PI-driven experiment at the Blanco Transform (Nabelek)



# Cascadia Initiative OBS Data is Available

- Seismic Data
  - IRIS DMC
- OBS Metadata
  - CIET web site
- There is some urgency to analyze Year 1 data prior to redeployment in Year 3



The screenshot displays the Cascadia Initiative Expedition Team website. The page title is "Cascadia Initiative Expedition Team". The navigation menu includes Home, Cascadia Initiative, CI Expedition Team, CI Expeditions, CI Education/Outreach, CI Data Highlights, and Resources and Experiments. The main content area is titled "Cascadia Initiative Data Highlights" and includes a "Table of contents [hide]" section with links to "Cascadia Initiative OBS Data Available at the IRIS DMC", "Cascadia Initiative Metadata", and "Orientation of OBS Horizontal Channels". Below this, there is a section titled "Cascadia Initiative OBS Data Available at the IRIS DMC" which states that ocean bottom seismometer (OBS) data from the 2011-2012 field season are now available at the IRIS DMC. It also mentions that additional data from the Year 1 deployment will be updated as they become available and that all Year 1 data will be available by Dec. 1, 2012. A section titled "Data availability can be viewed at the IRIS DMC MetaData Aggregator." lists relevant Virtual Network codes: 

- `_CASCADIA_OBS`: NSF Cascadia Initiative Offshore/OBS data
- `_CASCADIA-TA`: NSF Cascadia Initiative, Earthscope TA
- `_CASCADIA`: NSF Cascadia Initiative, Earthscope TA plus Regional Network Stations

Another section titled "Cascadia Initiative Metadata" lists useful metadata including: 

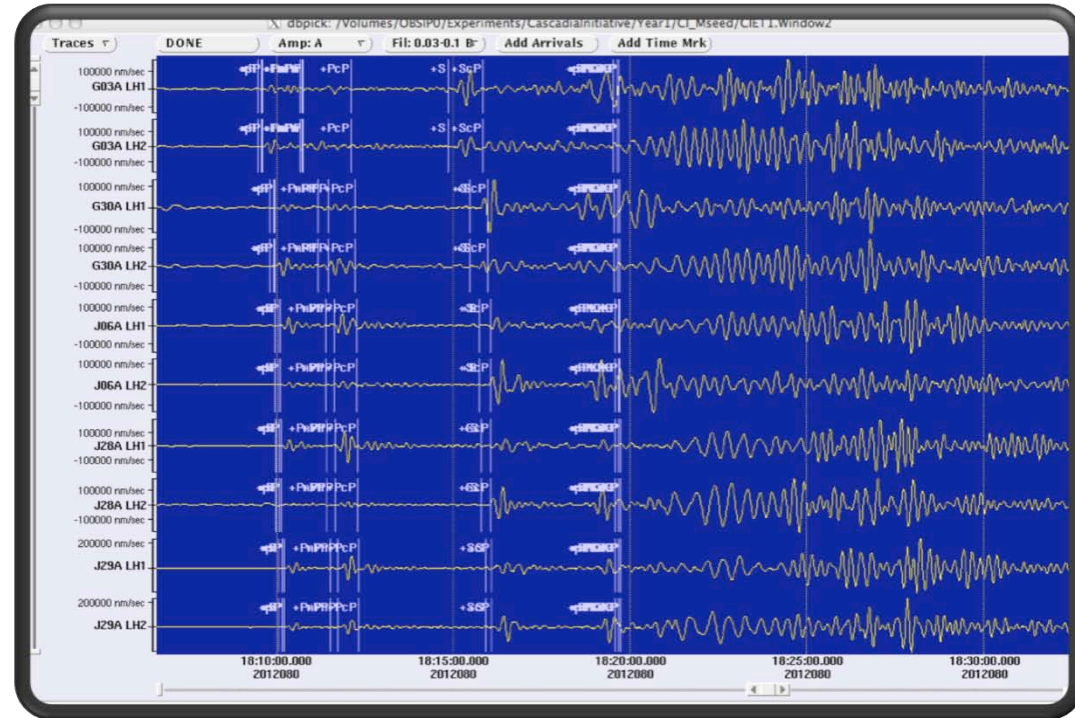
- Cruise reports from the 2011 and 2012 Expeditions. Cruise reports provide tables, plots and narratives of operations.
- 2011 Expeditions
- 2012 Expeditions
- WHOI OBS Metadata
  - CIET Year 1 WHOI Data Description. Description of recorded channels.
  - CIET Year 1 WHOI Clock Corrections. Table of clock corrections that have been applied to data at the IRIS DMC.
- LDEO OBS Metadata
  - CIET Year 1 LDEO Clock Corrections. Table of clock corrections that have been applied to data at the IRIS DMC.
- SIO OBS Metadata
  - CIET Year 1 SIO Clock Corrections. Table of clock corrections that have been applied to data at the IRIS DMC.

On the right side of the page, there is a map titled "Year deployed" showing a bathymetric map of the Cascadia Initiative study area with a color scale indicating depth.



# What needs to be done?

- Analyze Data!
  - Will Grays Harbor array be redeployed in 2013?
  - What is the data quality by site? Will influence 2013 prioritizations.
- Orient horizontals
  - IRIS OMO
  - Metadata will be posted on CIET web site

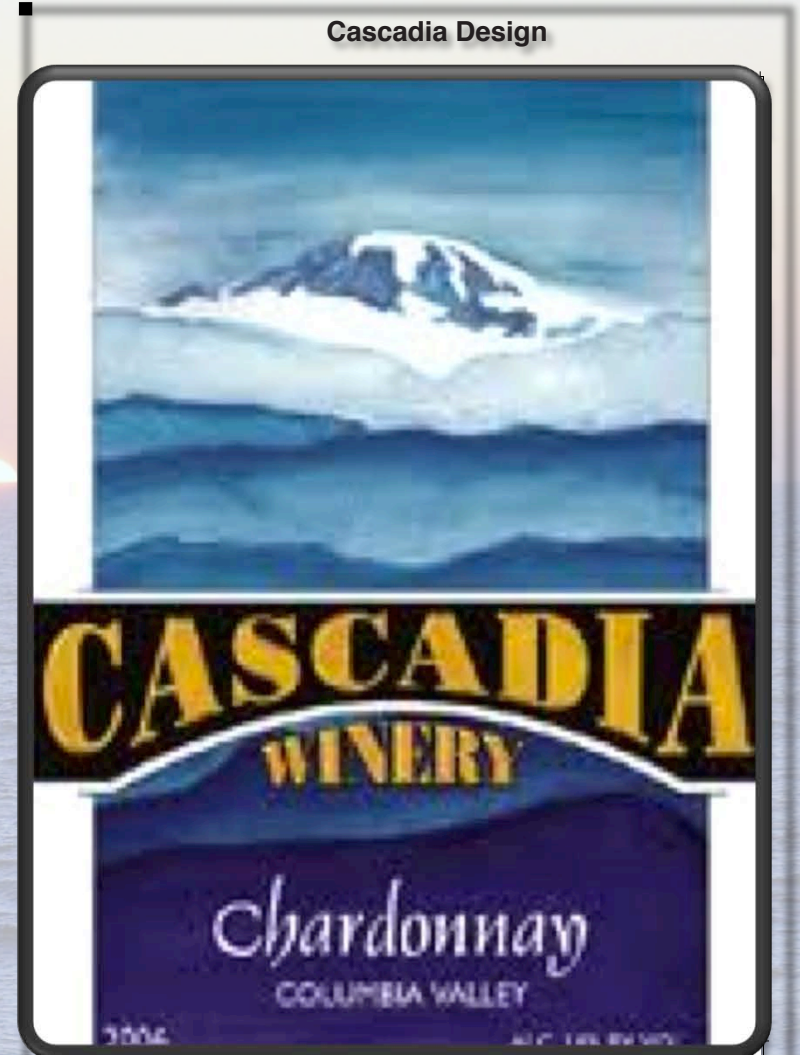


# Summary

Cascadia Initiative is an ambitious, plate-scale Community Experiment delivering open access data

How to participate:

- Seagoing expeditions
  - berths for students, post-docs and other scientists to participate
  - gain valuable experience in planning and carrying out an OBS experiment
- Download and analyze the data
  - Cascadia Wine to the first, first-authored paper by a graduate student that uses CI OBS data!
  - 2 bottles if student is not from an OBS related group!



131°W 130°W 129°W 128°W 127°W 126°W 125°W 124°W 123°W 122°W