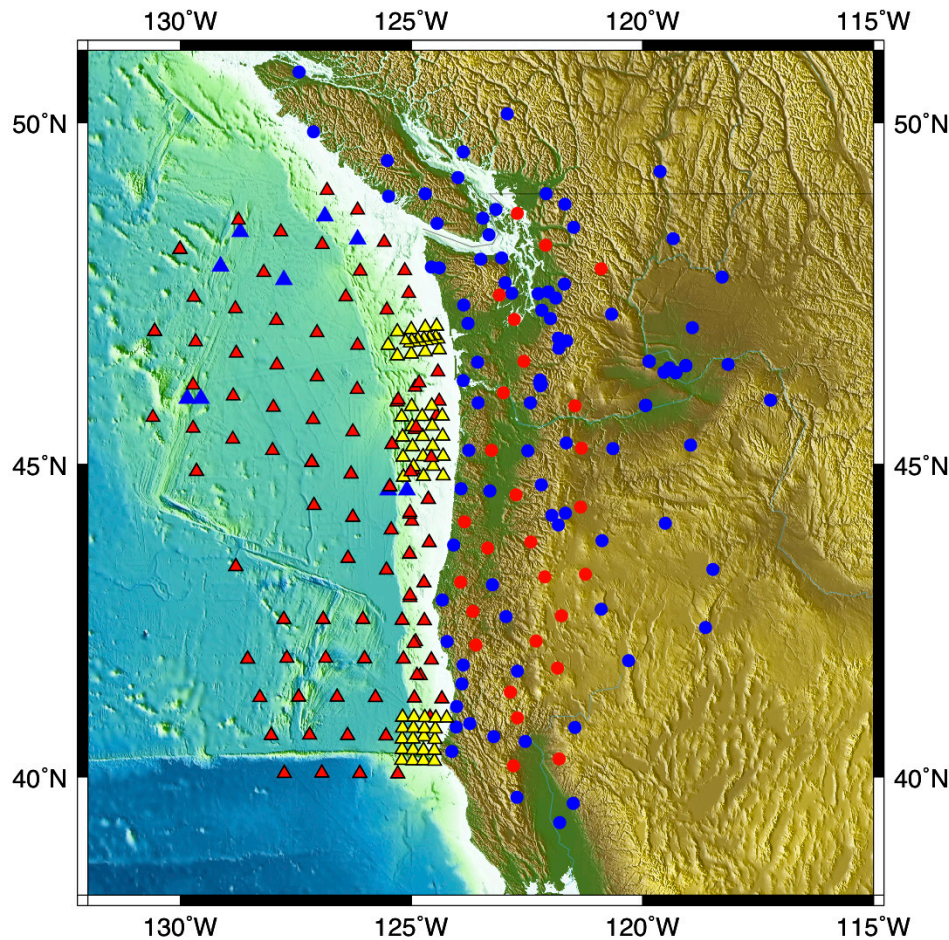


A Summary of the Cascadia Initiative

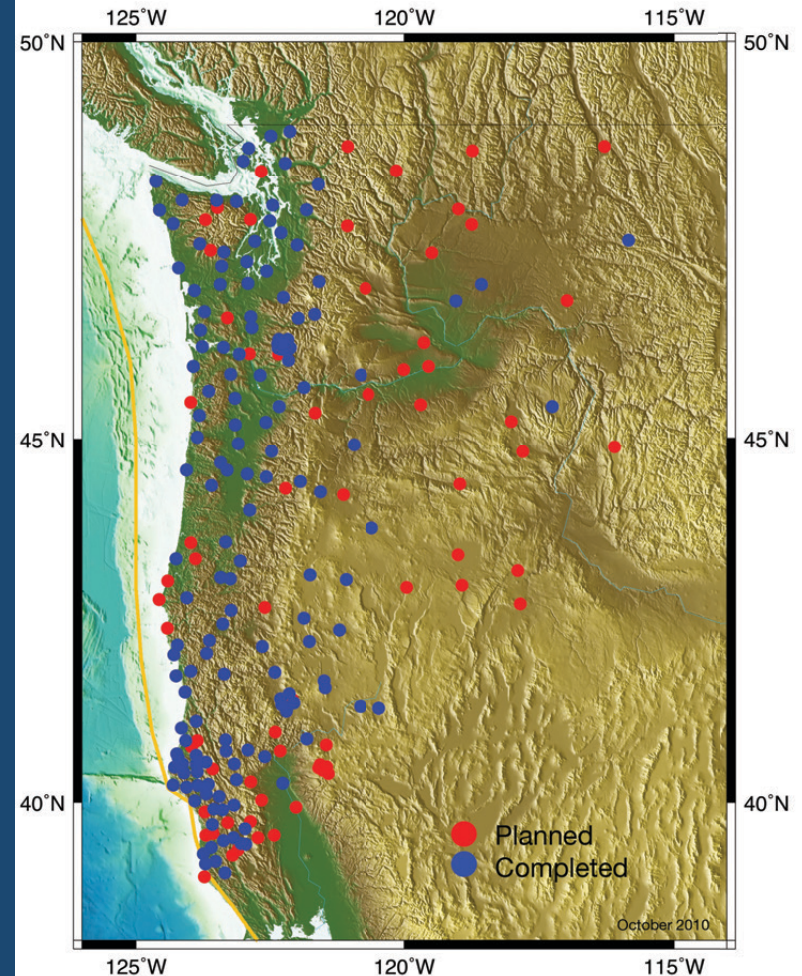
Jeff McGuire (WHOI)

Onshore-Offshore Seismic and Geodetic Community Datasets

Broadband Seismometers



High-Rate, Real-Time GPS



Cascadia Initiative: History

- May 2009 ARRA investment in MARGINS and EarthScope scientific objectives with *an initial focus* on amphibious studies in Cascadia with open data.
- \$5M onshore USArray (broadband) + PBO (GPS) enhancements
- \$5m offshore broad-band OBS, including shallow-water (OBSIP)
- Onshore instrumentation plans finalized by IRIS and UNAVCO in spring/early summer 2009
- ~25 person planning meeting at LDEO in July 2009 to identify targets for the facility and provide input to OBS design requirements
- Summer/Fall 2009 NSF/OBSIP oversight committee solicits proposals for 60 broadband OBSs (>20 shallow water).
- Fall 2009/Winter 2010, Amphibious Array Steering Committee organized (Richard Allen is the chair)
- October 2010, Open Community Workshop (~90 attendees; organized by McGuire, Goldfinger, Schwartz, Toomey, and Wang) in Portland focus on OBS deployment plans and identifying desired data products.

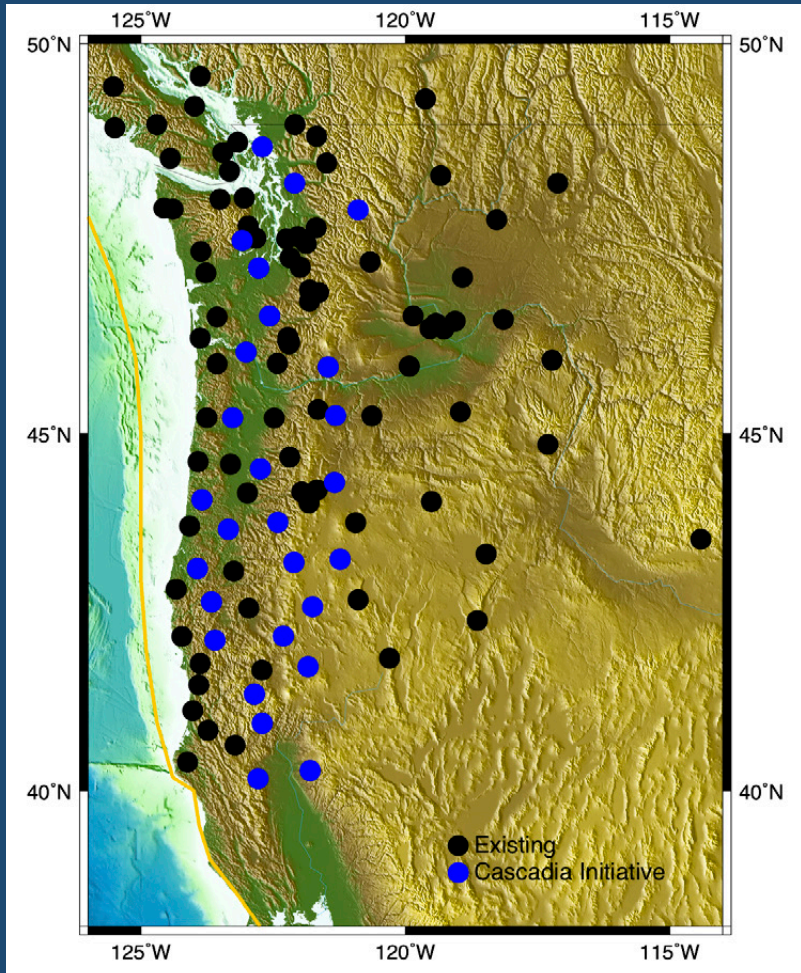
Cascadia Initiative Science Objectives

See <http://www.oceanleadership.org/2010/nsf-cascadia-initiative-workshop/>

- Thrust Interface and Forearc Prism
 - Integrated onshore/offshore observations of ETS events
 - Spectrum of slip behaviors in the forearc prism
 - Updip limit of the locked zone
 - Along strike segmentation of forearc structure/megathrust ruptures/ETS
 - complement onshore and/or active source imaging experiments
- Subduction Zone Structure and Dynamics
 - Flux of Volatiles; Serpentinization of the incoming plate
 - Tracking of fluid release by extending images of high fluid pressure regions offshore into the seismogenic zone
 - improved images of the deep mantle from extending USARRAY offshore
- Juan de Fuca Plate and Plate Boundaries
 - mantle anisotropy from ridge to trench and along transform faults
 - space-time variations in intraplate stresses and seismicity in the Gorda and Juan de Fuca plates
 - interactions between different JDF Plate boundaries

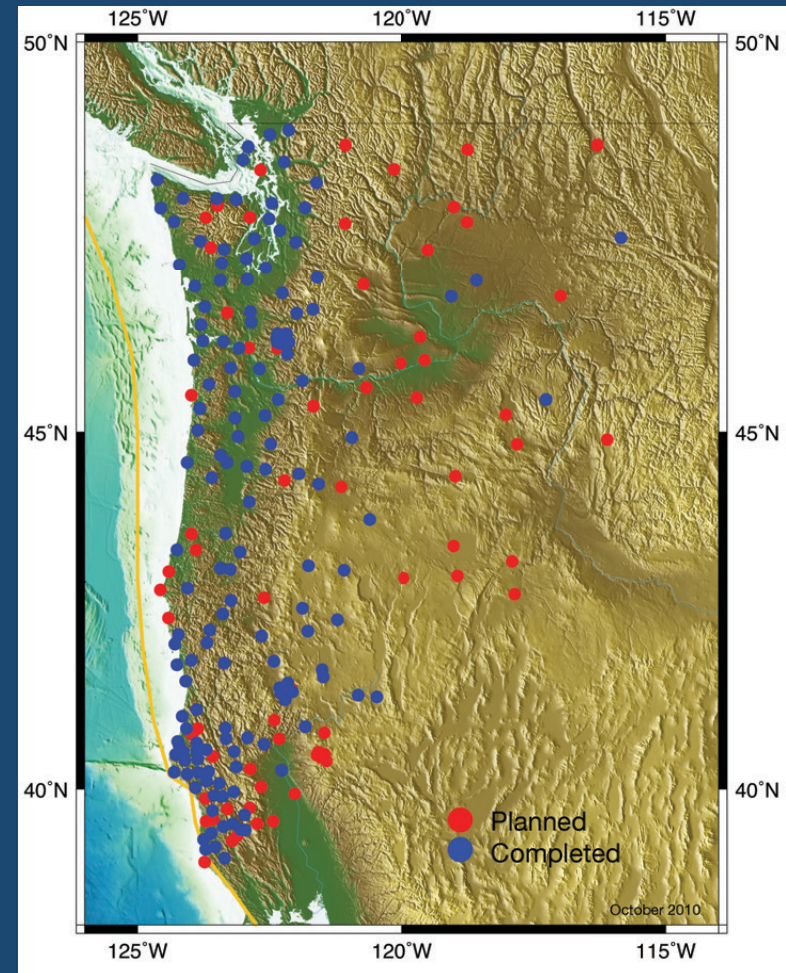
IRIS/USArray

- ARRA-funded supplement to USArray
- Redeploy 27 Transportable Array stations
- Operate and maintain stations until September 2013
- Current status: fully installed and operating



UNAVCO/PBO

- ARRA-funded upgrades to PBO
- Enable continuous, real-time streaming
- Upgrade from 30 s to 1 Hz epochs
- >173 of 233 are completed, all by Sept 2011





Cascadia OBS ARRA Initiative

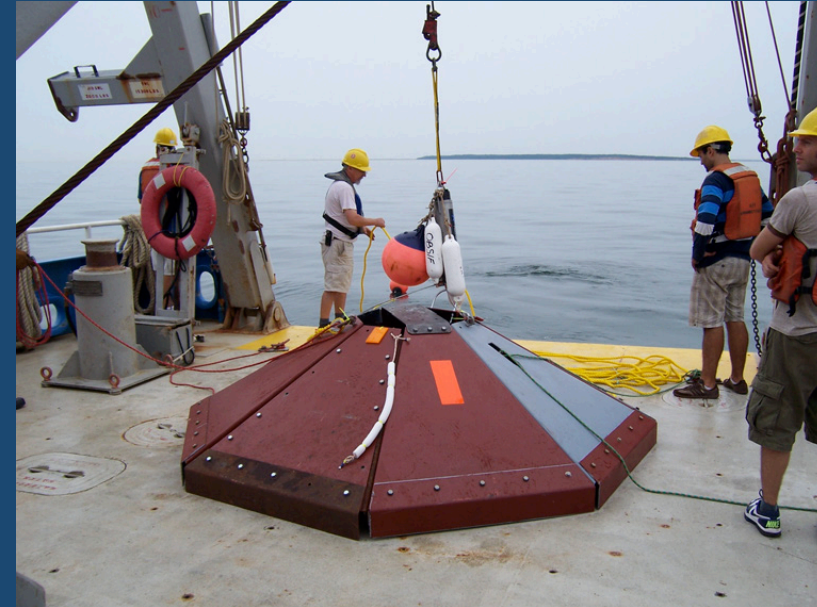
60 new broadband (Trillium Compact, ~120s – 100 Hz) OBS currently under construction at a cost of \$5M by the groups at LDEO (30), SIO (15), and WHOI (15).

20 LDEO and 15 SIO OBS will be installed in trawl-resistant enclosures; can be deployed in water depths extending from the shelf down to 1,000 m.

40 OBS deployable to of 6,000 m. Seismometer will be shielded with the goal of reducing horizontal-component noise.

All LDEO and most WHOI instruments will have an APG; WHOI and SIO instruments will also have a DPG.

LDEO Octodome



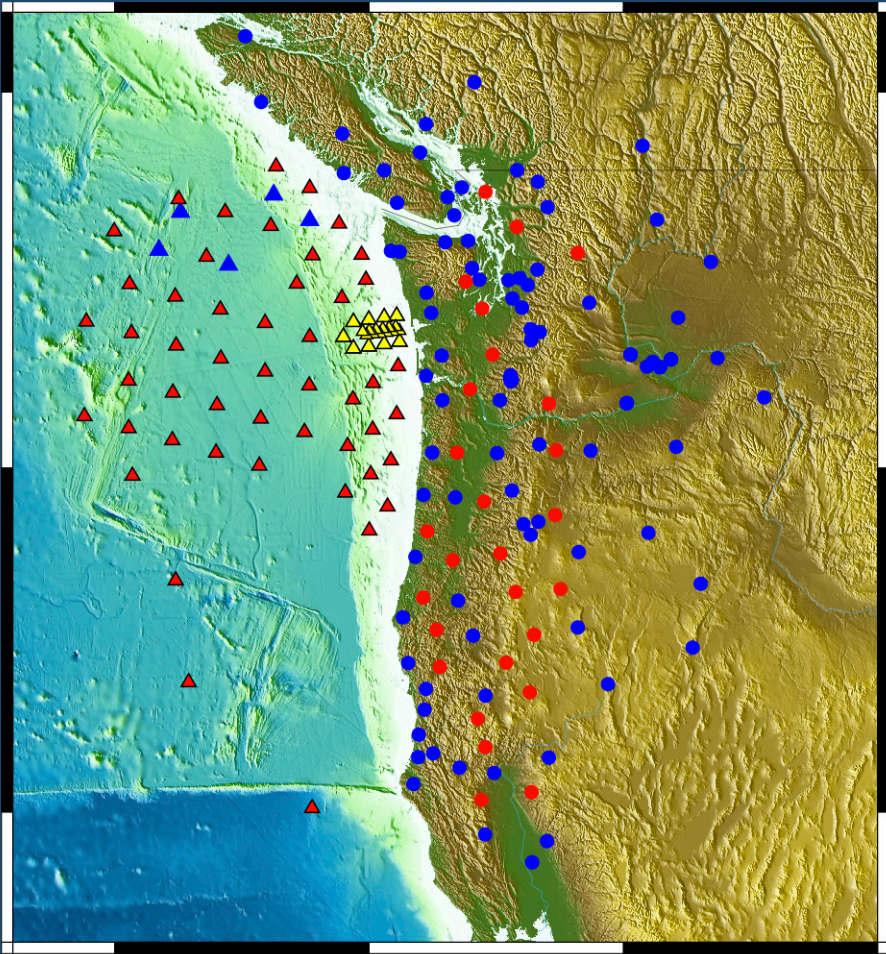
October 2010 Workshop Recommendations

See <http://www.oceanleadership.org/2010/nsf-cascadia-initiative-workshop/>

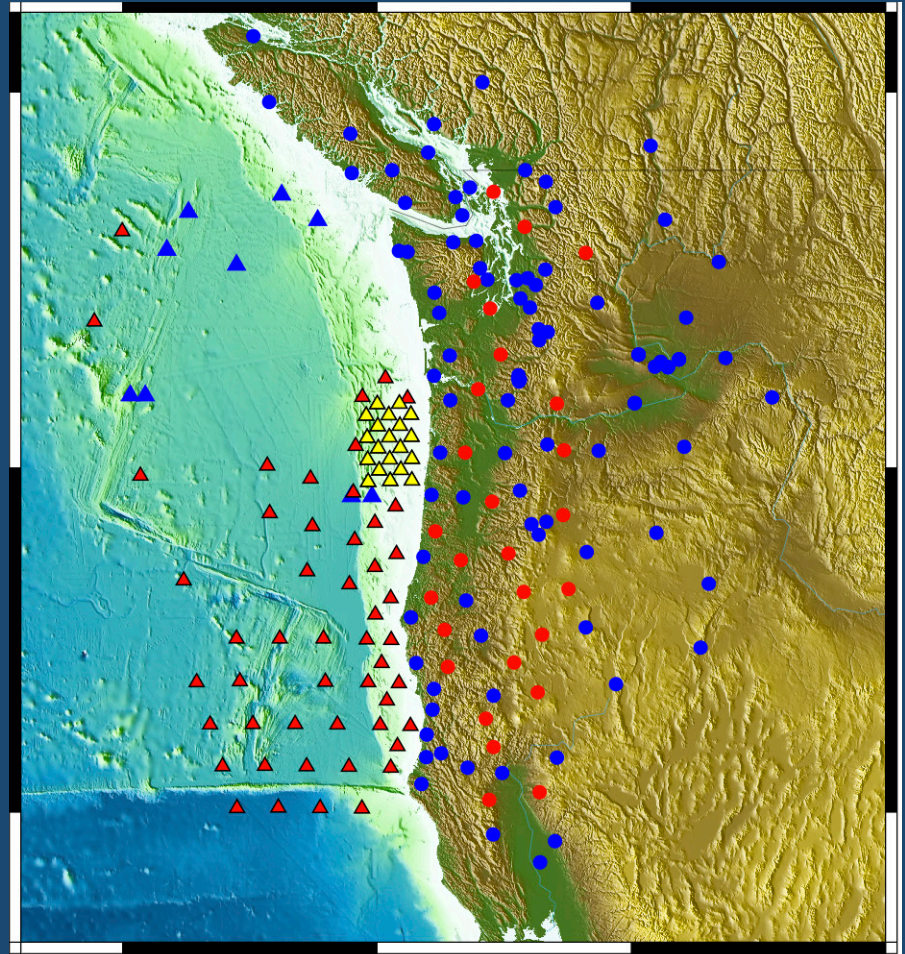
- A Four Year OBS deployment plan with 70 instruments per year can simultaneously achieve the main community objectives
 - A) 2 years of data monitoring of the forearc at ~30 km spacing
 - B) 2 years of data covering the entire JDF plate at ~70 km spacing
 - C) A focused experiment above the thrust zone extending the CAFÉ line
 - D) A focused experiment covering the segmentation boundary off Oregon
 - E) A focused experiment covering the high seismicity region near Mendocino
- A team(s) of PIs should self-organize to carry out the OBS deployment cruises
- A workshop should be held at the 2013 Earthscope meeting to evaluate the Year 3 deployment plan based on the Year 1 data
- A workshop should be convened in early 2014 by AASC to determine the future of the amphibious array.
- Data Products: OBS Orientations; GPS high-rate displacement time series; earthquake catalog (ANSS); tidal models at OBS; 3-D Community Velocity model; focal mechanism catalog;

October Workshop OBS Deployment Plan

Years 1 and 3



Year 4

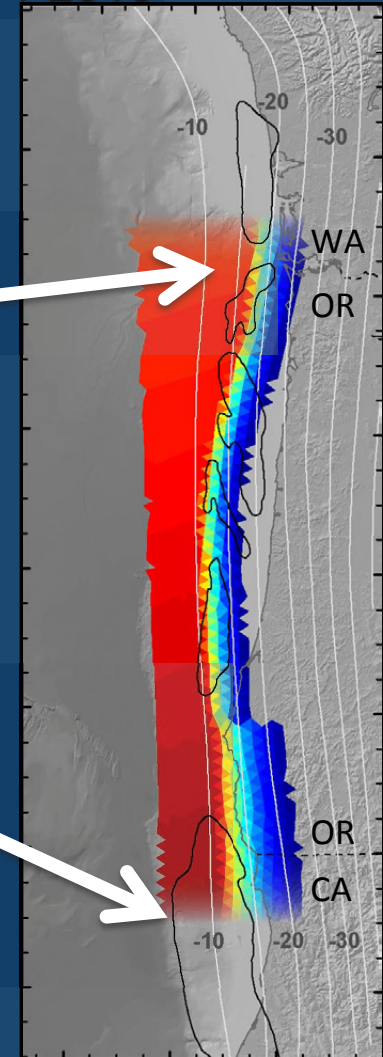
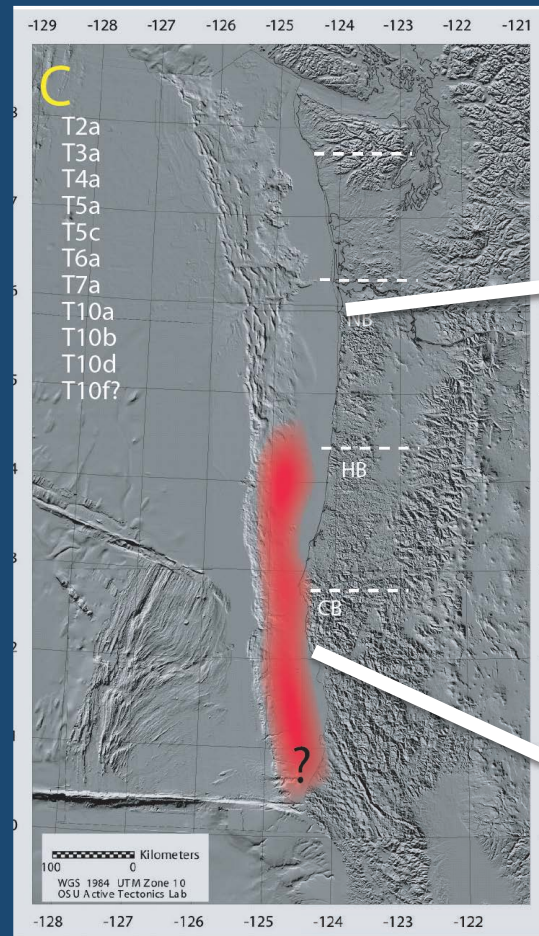
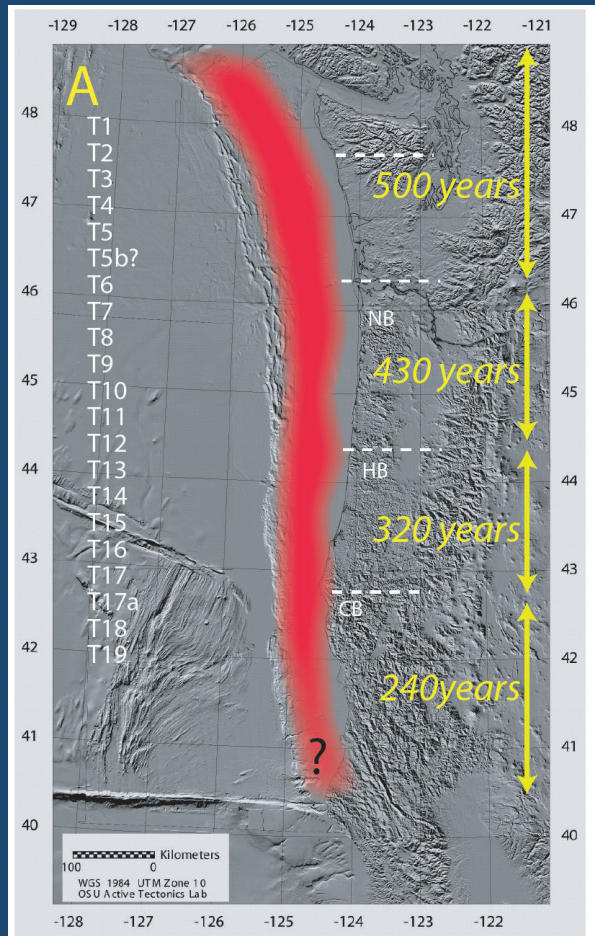


Many sites are reoccupied for a second year to ensure sufficient data quality

Opportunities for GeoPRISMS in Cascadia

Central Oregon Segment Boundary

Combined OBS and APG deployment in 2014-2015



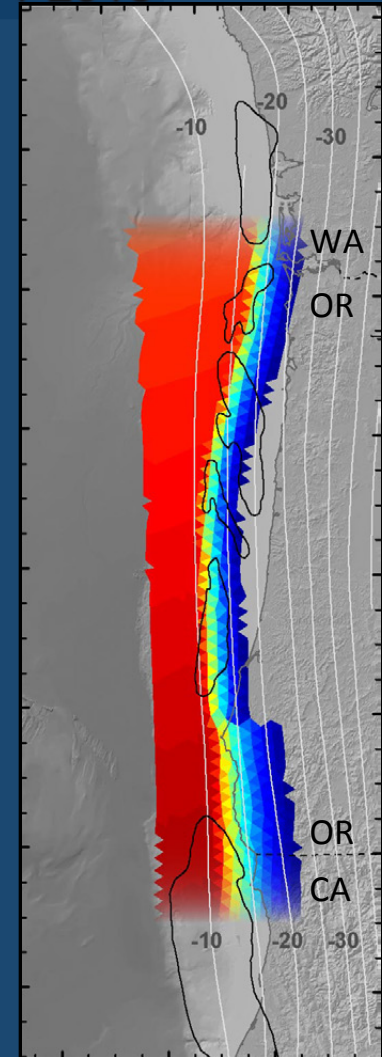
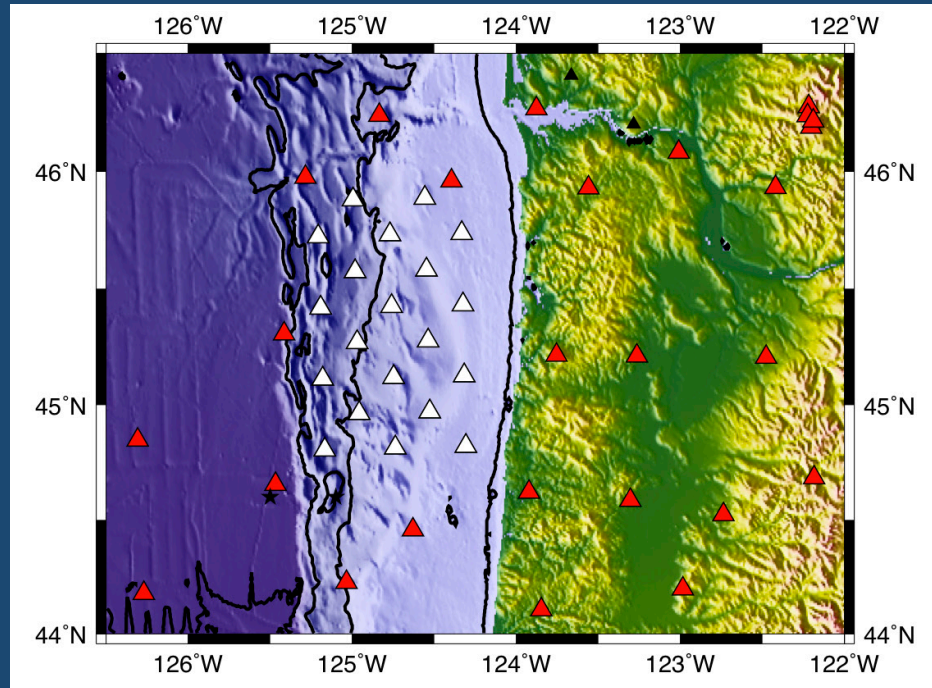
Turbidite derived paleo seismology
Goldfinger et al.

Geodetic derived locking
Burgette et al. (JGR, 2009)

Opportunities for GeoPRISMS in Cascadia

Central Oregon Segment Boundary

Combined OBS and APG deployment in 2014-2015

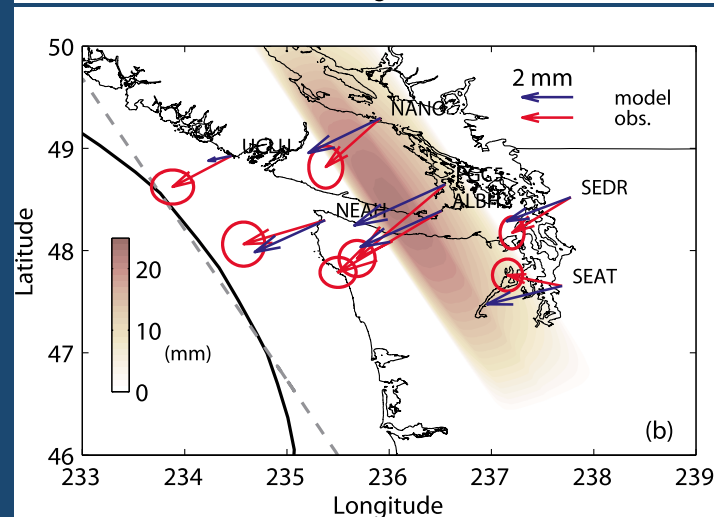
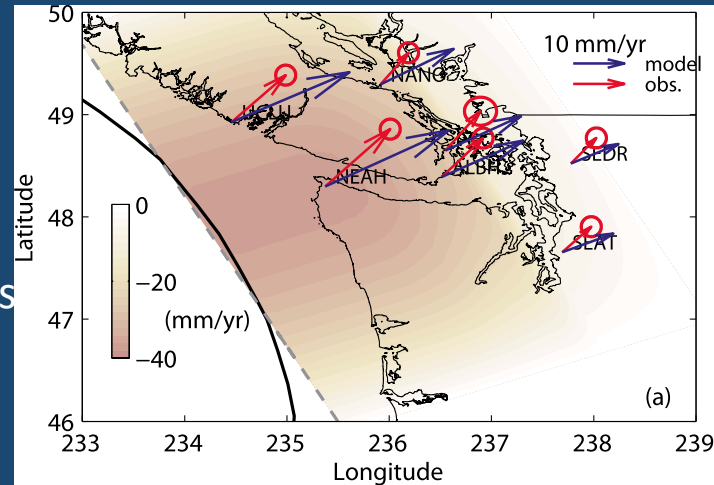
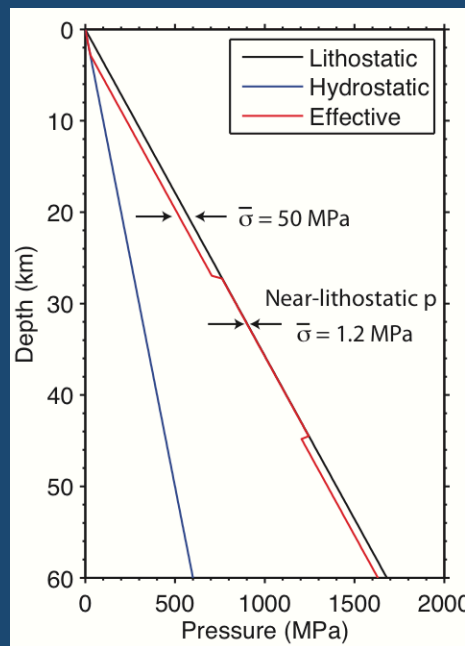


We have ~3 years to design the best possible onshore/offshore seismic + geodetic COMMUNITY experiment to study the structural properties of one of the best documented great earthquake rupture barriers.

Opportunities for GeoPRISMS in Cascadia

Direct Comparisons of Advanced Models and Data for ETS Events

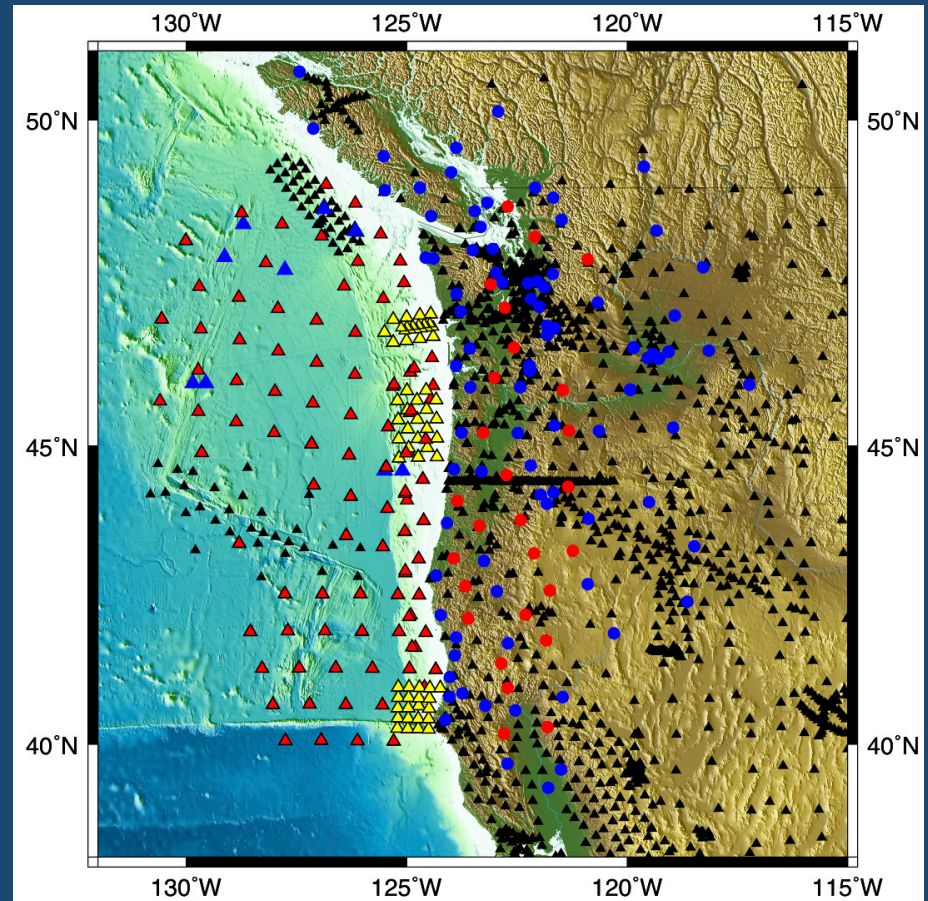
Liu and Rice 2009;
The pore-pressure distribution controls
“S” and can be adjusted
to match the GPS vectors



Opportunities for GeoPRISMS in Cascadia

Cascadia will be drowning in seismic and geodetic data (PNSN, PANGA, PBO, CI, NEPTUNE, OOI, ..) and individual PI studies in numerous disciplines regardless of what GeoPRISMS does from 2011-2020.

Cascadia needs an overarching, SCEC-like, collaborative organization that takes the existing, high-quality efforts in the region and integrates their results into higher level products that accelerate research progress.



Projected IRIS DMC seismic data archive In September 2015.

