

CRESCENT Working Groups and Special Interest Groups

Ground Failure (GF) *presented by* **Ben Leshchinsky**

Community Fault Model (CFM) *presented by* **Ashley Streig**

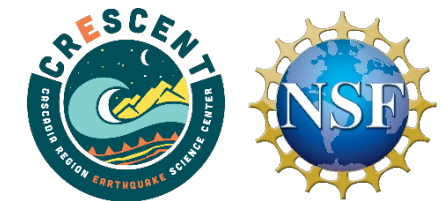
Dynamic rupture, Earthquake cycles, Tsunami models (DET) *presented by*
Maricela Best McKay

Coupling, Seismicity, Slow Slip (C3S) *presented by* **Brendan Crowell**

Community Velocity Model (CVM) and Ground Motion Modeling
(GMM) *presented by* **Valerie Sahakian**

Cascadia Paleoseismology (CPAL) and Tsunami Sources for Hazard
Assessment (TSHA) *presented by* **Carrie Garrison Laney**

Offshore Observations (OO) *presented by* **Harold Tobin**





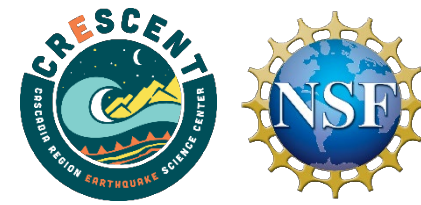
Community Fault Model Working Group Update

presented by
Dr. Ashley Streig (Washington Geological Survey)

Partnerships & Applications Workshop 2026

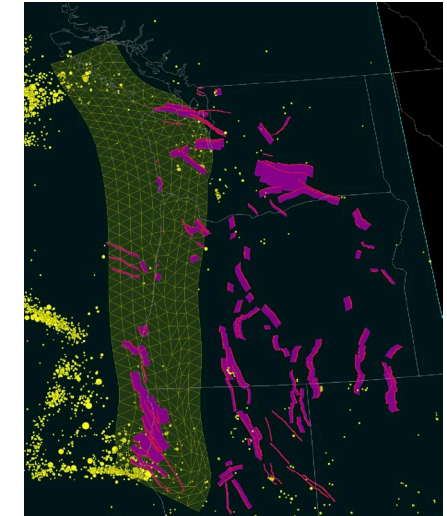
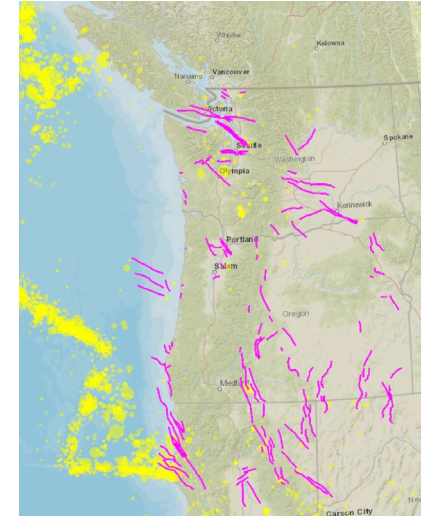


What is the Community Fault Model (CFM)?



Goals:

1. Build 3D fault model of the Cascadia subduction zone incorporating:
 - i. onshore upper plate faults
 - ii. offshore upper plate faults
 - iii. megathrust plate boundary
2. Provide open-source products for the community including:
 - i. 2D and 3D fault geometries
 - ii. 3D models of slab geometries
 - iii. metadata table
 - iv. interactive web viewer

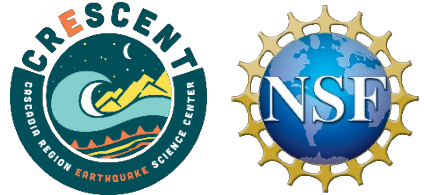


Some anticipated uses of the CFM:

- Dynamic earthquake rupture modeling and shaking simulations
- Knowledge of stress accumulation on faults
- Seismic hazard assessment (Community)



CFM community engagement



- Peer review of CFM version 1.0 – just completed.
- Surveys sent out to potential users to solicit input on CFM content and products
- Collaboration with SCEC CFM developers virtually and in-person
- Presentations and feedback at interdisciplinary conferences
- CFM Topical Workshop
 - In-person and hybrid participation
 - Fault feedback forms

Community Fault Model (CFM)
 Topical Workshop
 August 12-13, 2025
 Portland, OR

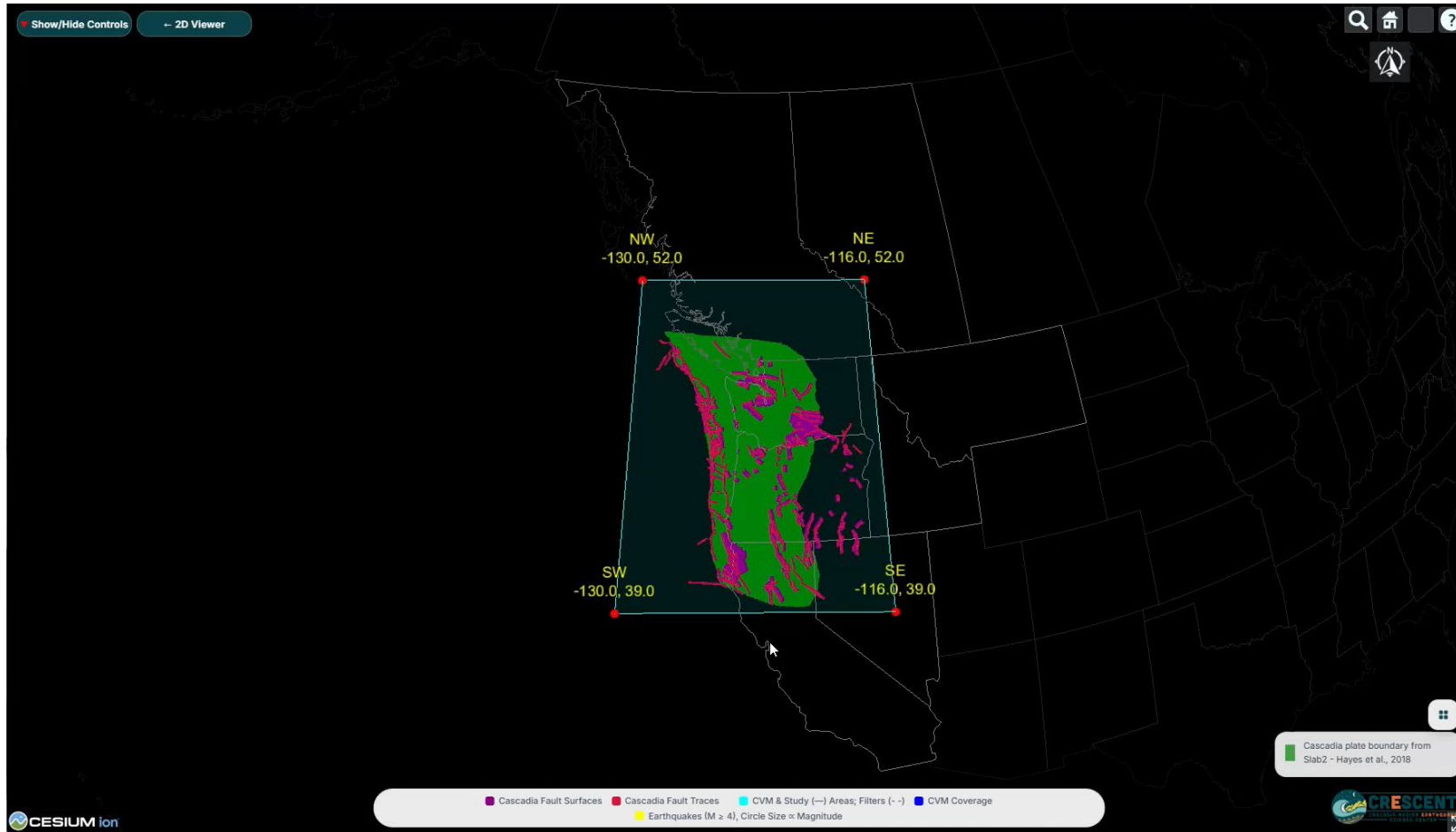
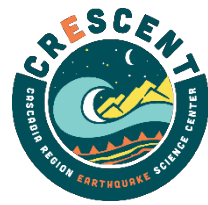


CRESCENT
 CASCADIA REGION EARTHQUAKE
 SCIENCE CENTER

CFM agency collaborators:



CFMv1.0 (*under review*)



DET Leadership Team



Eric Dunham
DET Lead
Stanford University
edunham@stanford.edu



Alice Gabriel
University of California San Diego
algabriel@ucsd.edu



Brittany Erickson
University of Oregon
bae@uoregon.edu



Benchun Duan
Texas A&M University
bduan@geos.tamu.edu



Ruth Harris
United States Geological Survey
harris@usgs.gov



Ignacio Sepulveda
San Diego State University
isepulveda@sdsu.edu



Yihe Huang
University of Michigan
yih@umich.edu



Yajing Liu
McGill University
yajing.liu@mcgill.ca



James Biemiller
United States Geological Survey
jbiemiller@usgs.gov

DYNAMIC RUPTURE, EARTHQUAKE CYCLE, AND TSUNAMIS (DET) Working Group Update

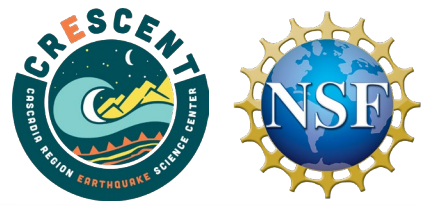
*presented by Dr. Maricela Best
(University of Oregon)*



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Dynamic Rupture, Earthquake Cycle, and Tsunamis (DET)

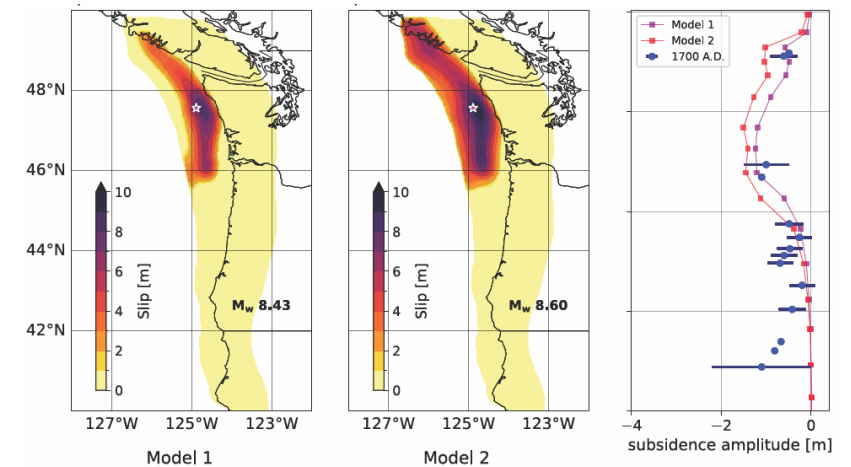


Working Group Objectives

- “Dynamic ruptures” - Models of earthquakes from knowledge of stress conditions on the fault & tsunami generation
 - ✦ Single-event dynamic ruptures (with coupling to ocean for tsunami generation)
 - ✦ Earthquake cycle models spanning thousands of years, capturing earthquakes, and other types of tectonic motion
- Community code verification
 - ✦ Dynamic rupture (including coupling with tsunami) & earthquake cycle benchmarks
 - ✦ Joint with SCEC/USGS

Products & Outcomes

- Open-source software
- Web platform for code comparison

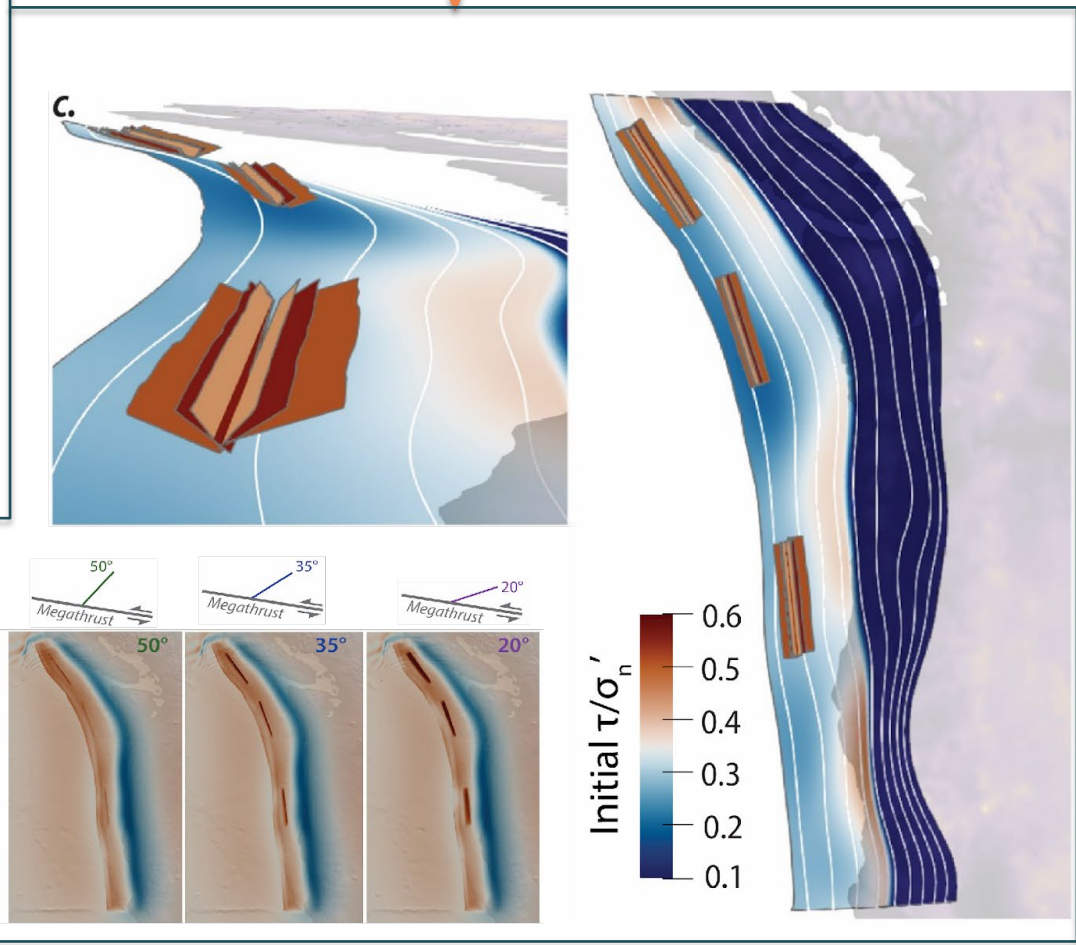
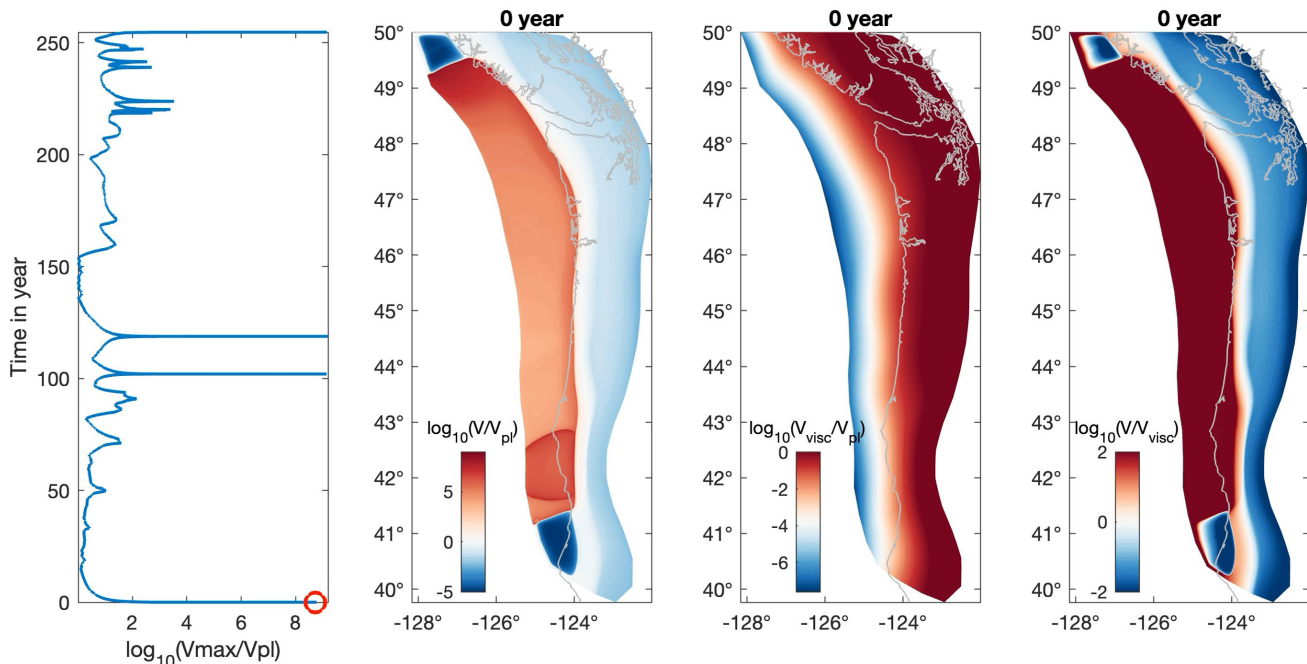


(Glehman et al., 2025, Seismica, 2(4))

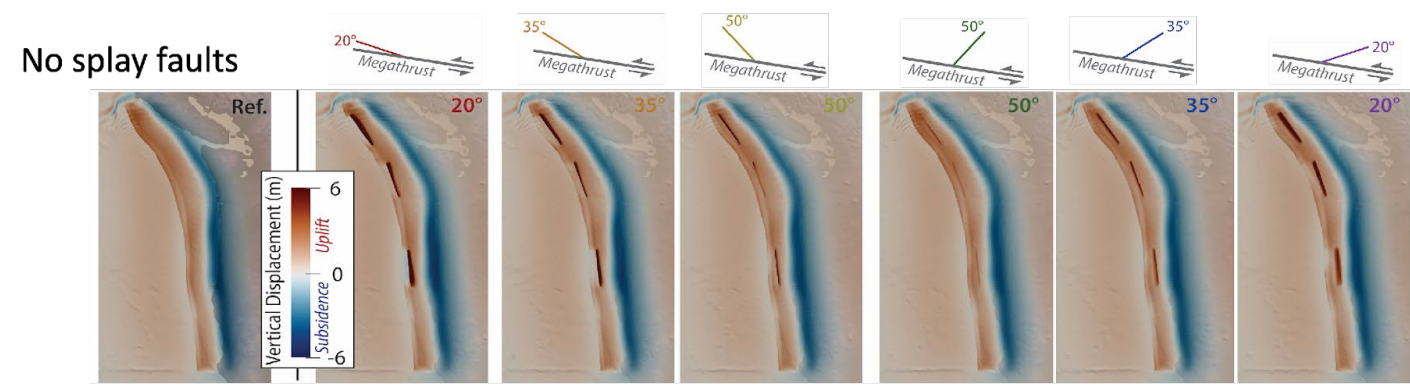
Examples of DET Models



Dynamic Rupture (with splays) + Tsunamigenesis at Cascadia



Earthquake Cycle Simulations





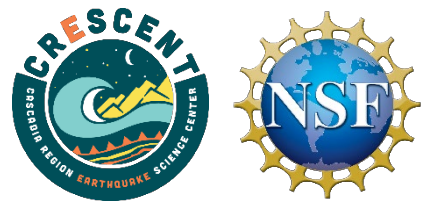
Coupling, Seismicity, and Slow Slip (C3S) Working Group Update

presented by
Dr. Brendan Crowell (The Ohio State University)

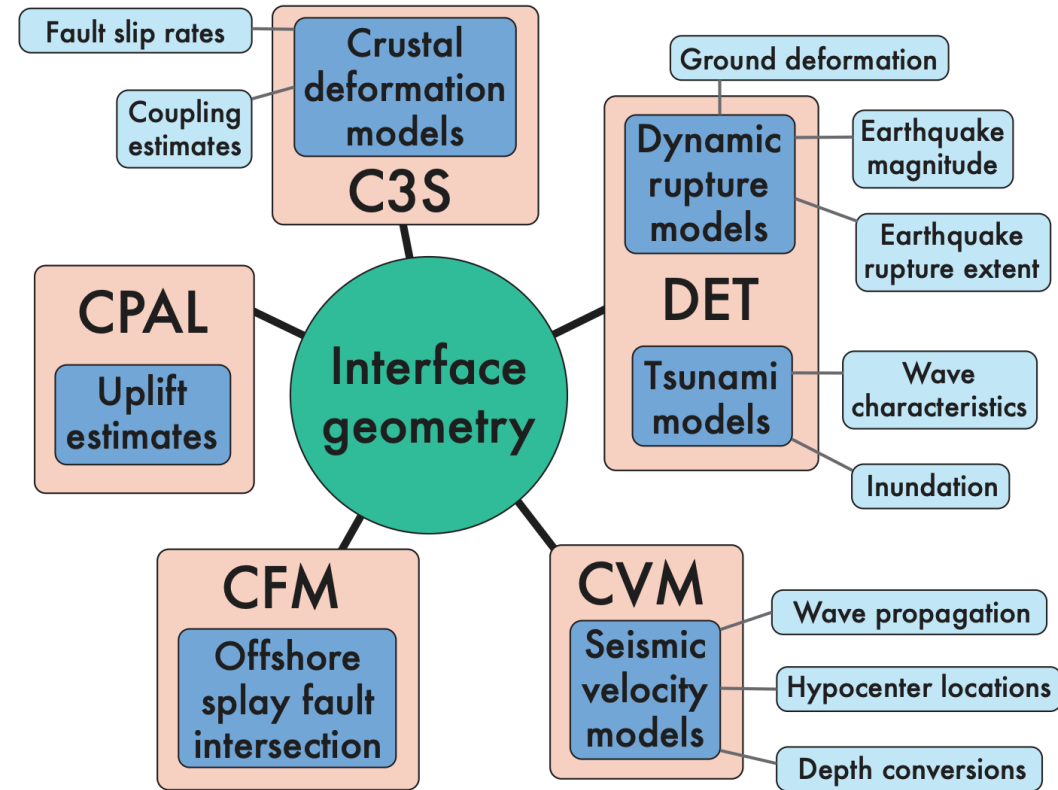
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C3S Applications



- The overarching theme of C3S is to characterize strain accumulation and release throughout Cascadia.
- The main products are an enhanced seismicity catalog, a (time-dependent) interseismic coupling model, and a slow-slip catalog.
- The products interplay with the development and interpretation of other WG products.



CRESCENT Working Groups

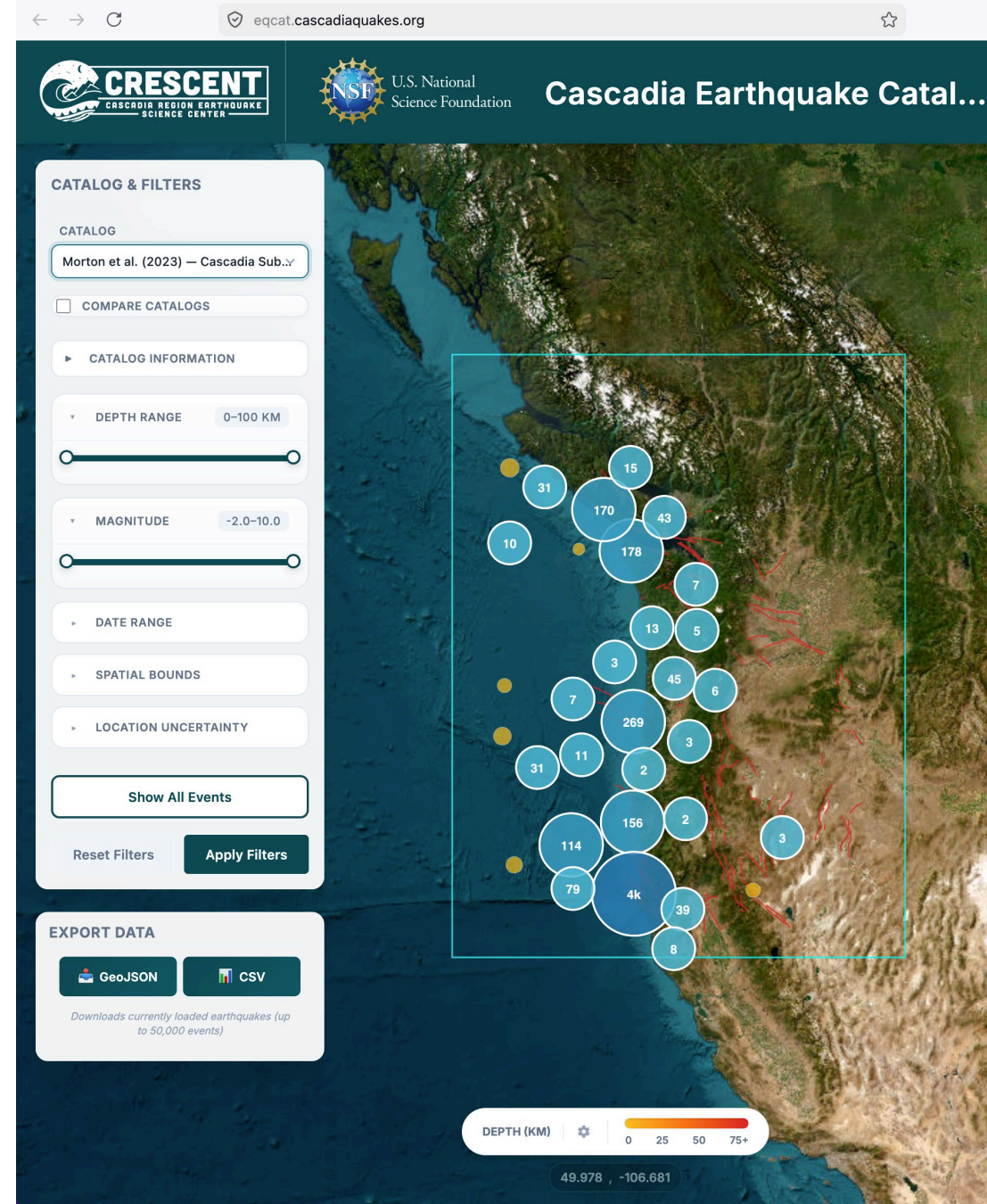
C3S - Coupling, Slow-Slip, & Seismicity
CFM - Community Fault Model
CPAL - Cascadia Paleoseismology

CVM - Community Velocity Model
DET - Dynamic Rupture, Earthquake Cycle, & Tsunamis

Seismicity Viewer

- The CRESCENT EQ Catalog viewer is an interactive way to display/compare different earthquake catalogs.
- Information is put into the context of the CFM and users can output desired information.
- Similar viewers for coupling and slow-slip are forthcoming, which can be used for PSHA/PTHA purposes.

<https://eqcat.cascadiaquakes.org/>





Community Velocity Model (CVM) Working Group and

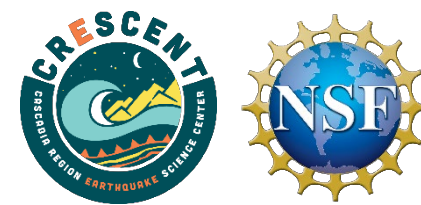
Ground Motion Modeling (GMM) Special Interest Group Updates

presented by
Dr. Valerie Sahakian (University of Oregon)

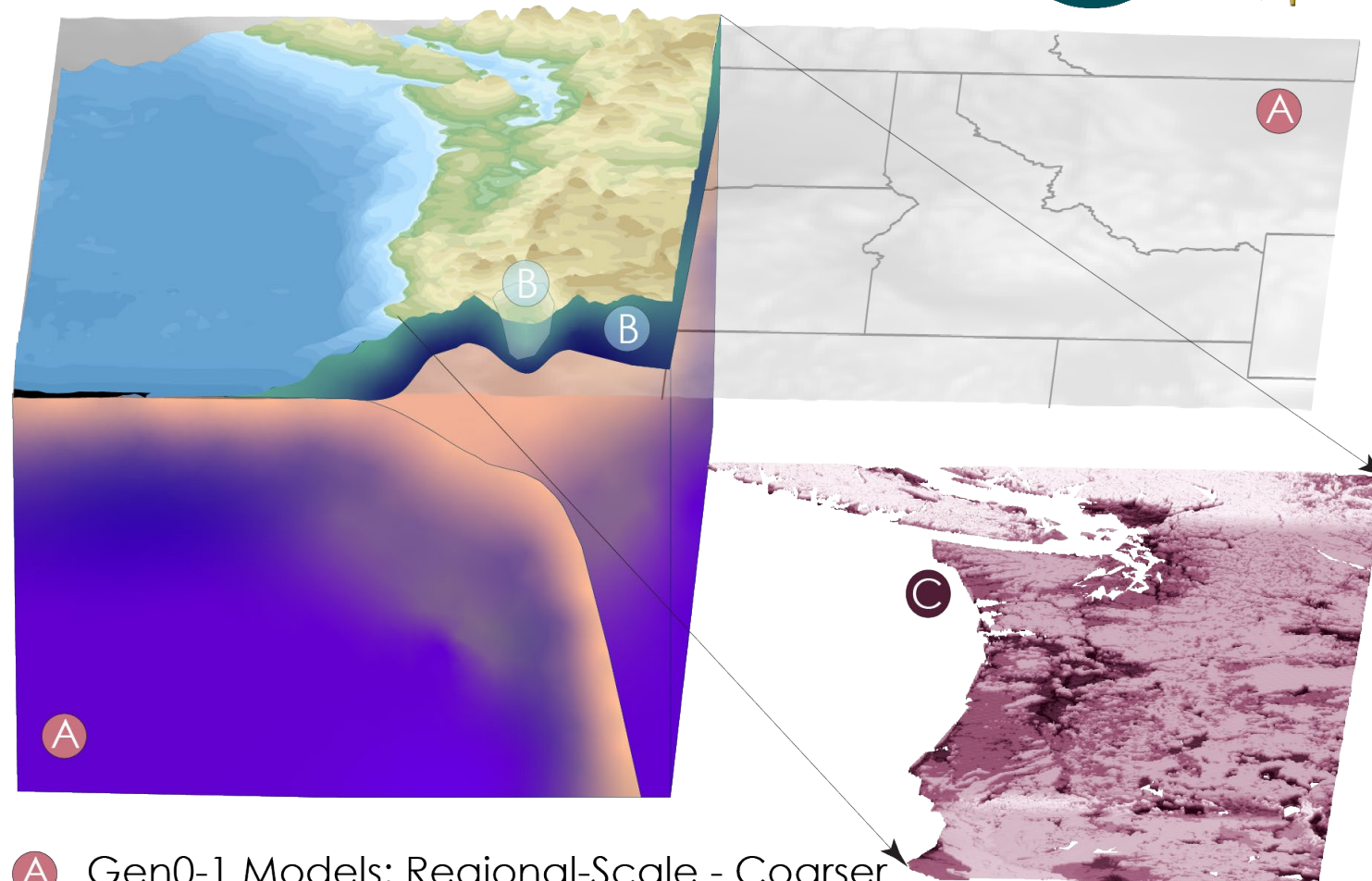
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Community Velocity Model (CVM)



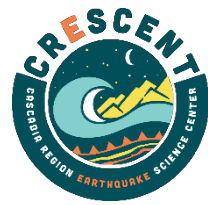
- Produce models of Earth structure (velocities)
- Key input for some simulated earthquake scenarios to capture shaking due to site effects
- Existing velocity models, CRESCENT's:
 - Cover broader region
 - Improve characterization of shallow site effects
- v0 complete; v1 and v2 in progress



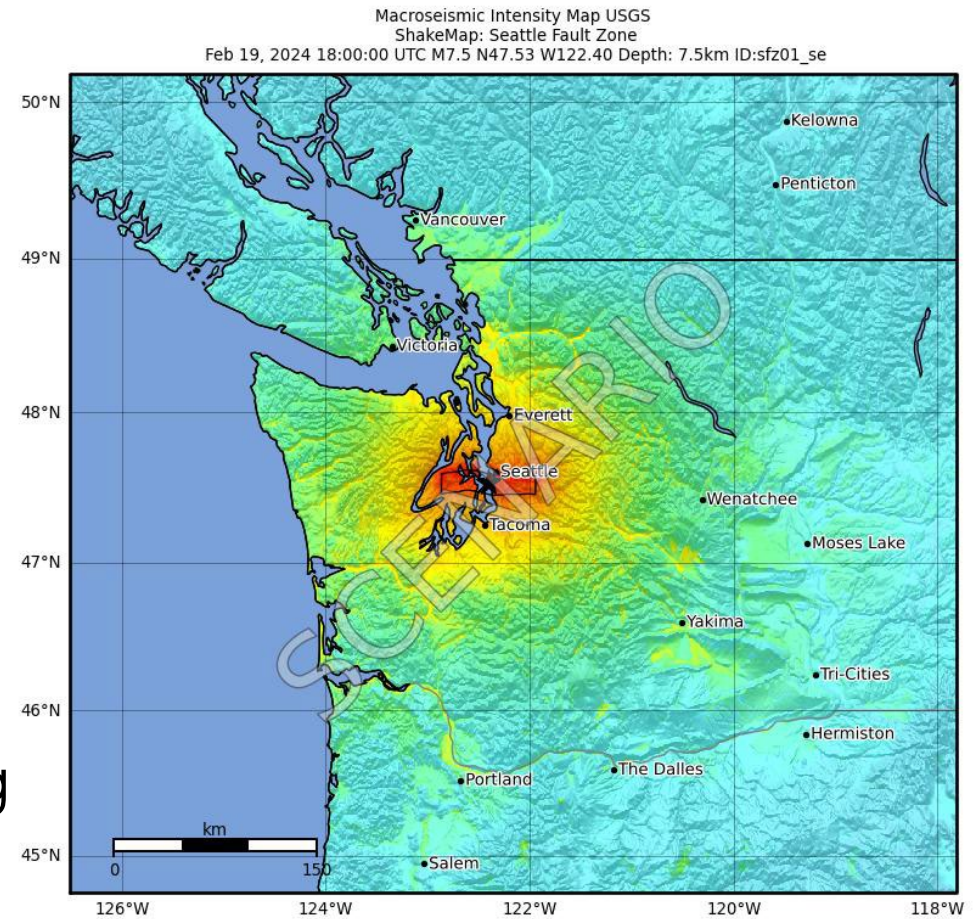
- A** Gen0-1 Models: Regional-Scale - Coarser
- B** Gen2 Models: Upper Crustal - Higher Resolution, Shallower, Basins
- C** Gen3 Models: Near-Surface - Geotechnical Layer and Topography

Sahakian et al. (2026)

Ground Motion Modeling SIG



- Estimating ground motions are a fundamental component of estimating seismic hazard, and shaking in scenarios
- GMM SIG serves as an intellectual community for:
 - Improving ground motion models in CSZ
 - Frontiers of methods for modeling ground motions
 - Collaborative approaches to translating science to practice
- Would love to collaborate and learn about your interests and priorities



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0464	0.297	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.0215	0.135	1.41	4.65	9.64	20	41.4	85.8	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Worden et al. (2012) Version 1: Processed 2024-03-29T23:26:50Z
 △ Seismic Instrument ○ Reported Intensity ★ Epicenter □ Rupture

USGS



Cascadia Paleoseismology (CPAL) Working Group and

Tsunami Sources for Hazard Assessment (TSHA) Special Interest Group Updates

presented by
**Dr. Carrie Garrison-Laney (Washington Sea
Grant)**

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The CRESCENT Paleotsunami working group

Looking to the past to better understand the future:

- Quantifying the deformation (land level change) of past earthquakes to better understand CSZ dynamics
- Mapping the locations and extents of tsunami deposits to better understand past earthquake and tsunami generation
- Applying modern dating strategies and methods to obtain more precise ages better understand the spatial variability and frequency of past earthquakes
- Enhancing our ability to forecast coastal impacts and assess long-term risks for communities and infrastructure in Cascadia's low-lying coastal zones



Tina Dura wrangling a core

post-EQ
tidal
mud

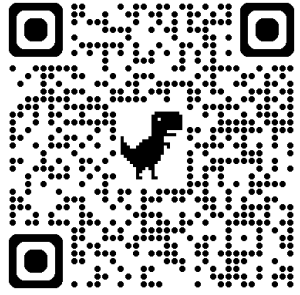
tsunami
sand

pre-EQ
soil



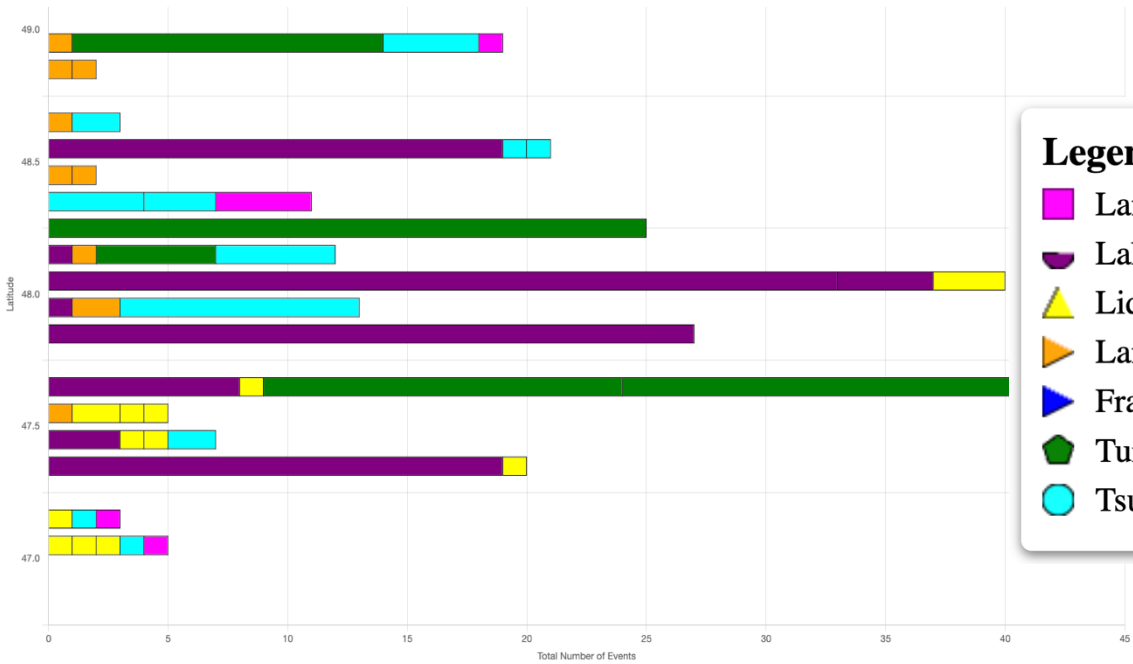
CPAL Viewer

CPAL Viewer



The CRESCENT Cascadia Paleoseismology (CPAL) Viewer is a web-based platform for mapping, cataloging, and visualizing paleoseismic datasets associated with past earthquake evidence along the Cascadia Subduction Zone. The viewer allows users to filter by paleoseismic evidence type, location, quality of age control, and certainty of source mechanism. The CPAL Viewer is an open source tool. Code is available on the [CRESCENT GitHub](https://github.com/crecident). The underlying dataset is from the *Compiled onshore and offshore paleoseismic data along the Cascadia Subduction zone: U.S. Geological Survey data release*, <https://doi.org/10.5066/P13OJQYW>.

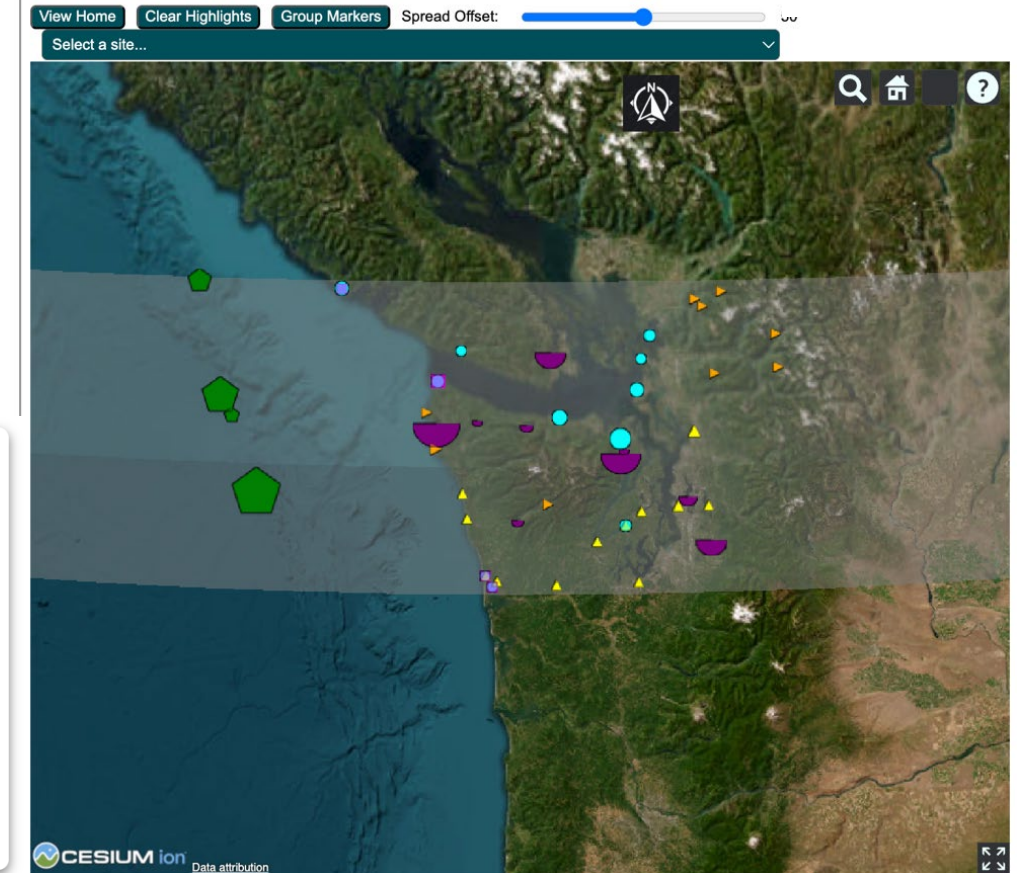
CPAL database viewer doi: <https://doi.org/10.5281/zenodo.15866114>



Legend:

- Land-level Change
- Lake/Inlet
- ▲ Liquefaction
- ▲ Landslide
- ▲ Fragile feature
- Turbidite
- Tsunami

CRESCENT Paleoseismic Dataset(s)



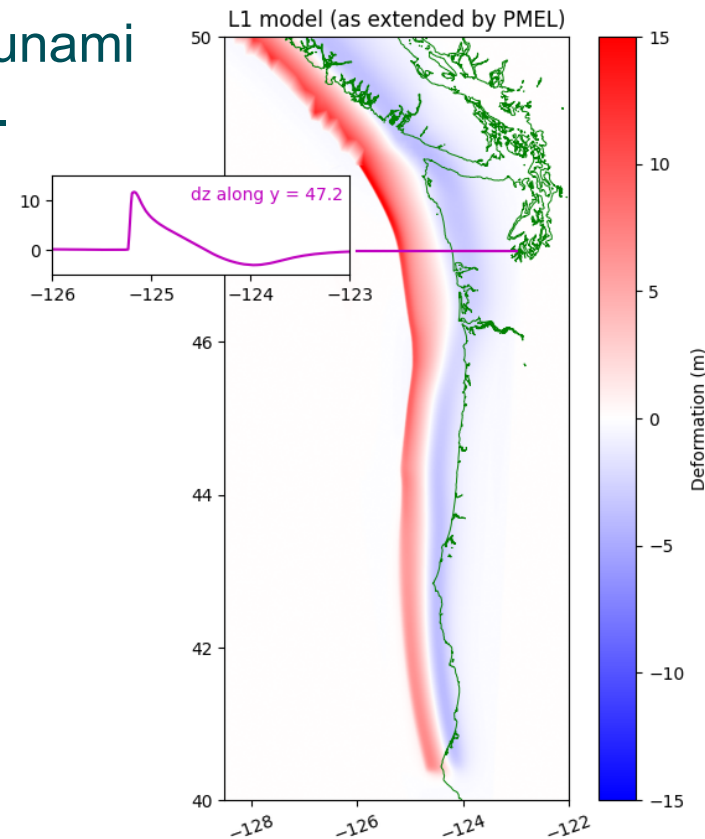
Tsunami Sources for Hazard Assessment (TSHA)

A CRESCENT Special Interest Group

Primary goal: Reduce uncertainty among users and practitioners of how best to develop and use tsunami sources for hazard assessment.

Many CSZ tsunami sources:

- T-Shirt size events (S, M, L, XL, XXL)
- Powell Center sources
- Fakequakes
- CoPes Hub sources
- Dynamic rupture models
- Others...



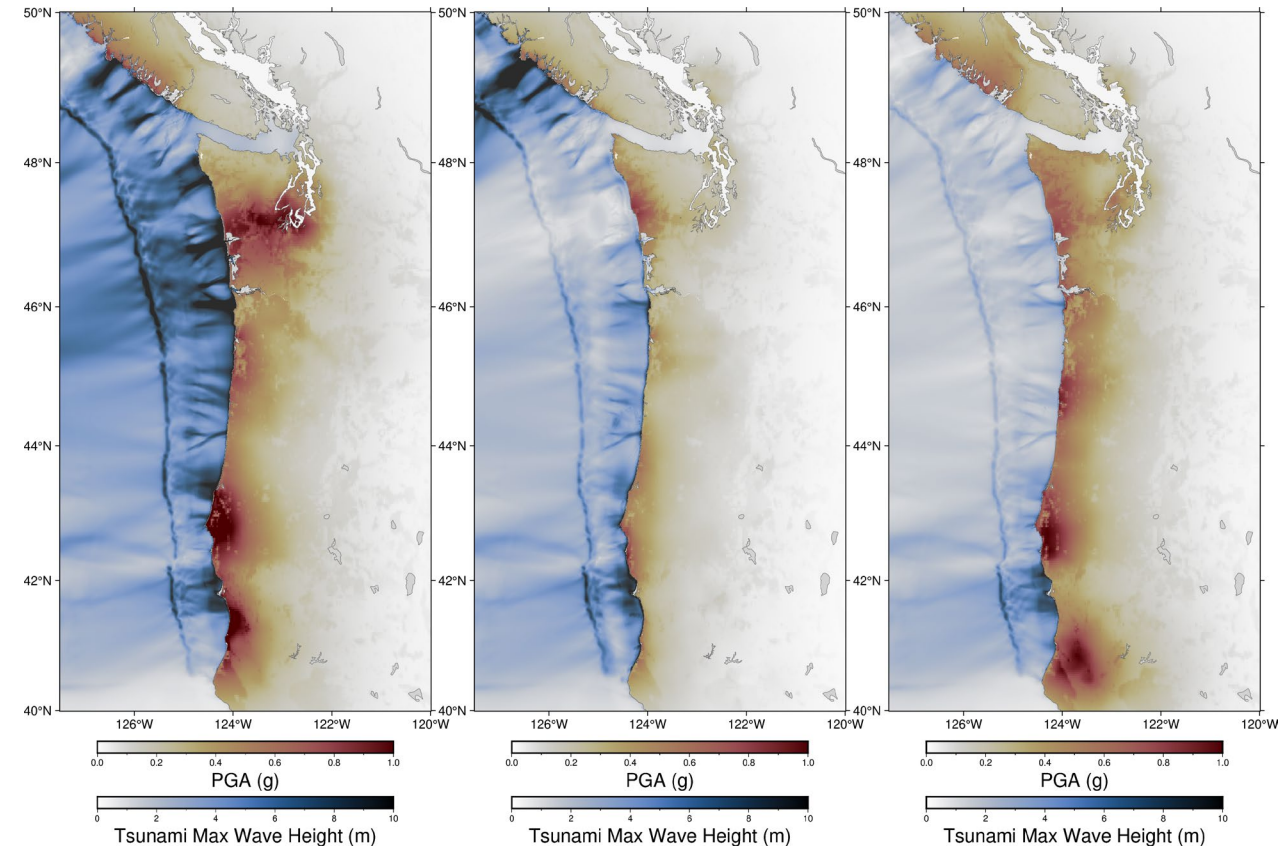
Some uses:

- Probabilistic or deterministic modeling
- Inundation maps, evacuation routes
- Maritime studies for ports, marinas
- Estimating forces on structures
- Multihazard studies (EQ + TSU + landslides)
- Understanding paleo evidence (extents, return times)
- Exploring effects of fault properties on tsunamigenesis
- Training machine learning algorithms
- Testing numerical methods, fluid dynamics models, grid resolutions

Tsunami Sources for Hazard Assessment (TSHA)

Goals and community-driven tasks:

- **Help** tsunami modelers and stakeholders understand the many different sets of tsunami source models and their appropriate use
- **Promote** transparent reproducibility of methods and foster continued improvements to models.
- **Collaborate** with other CRESCENT Working Groups to include information on past inundation and land-level changes as context to tsunami sources.
- **Extend** focus to global subduction zones and crustal faults.
- **Collect** and catalog sources in open data repositories and develop software and tutorials to facilitate their use.



Above: Cascadia CoPes Hub scenario examples pairing PGA and maximum tsunami amplitude from the same earthquake source (Courtesy of Audrey Dunham (USGS) & Yong Wei (UW, NOAA))



Tsunami Sources for Hazard Assessment (TSHA)

The source you use depends on your needs!

- You might need a probabilistic set of sources with well understood uncertainties.
- You might need a single source / small set with particular characteristics.
- You might need a time-dependent source.
- You might need coupled seismic/tsunami output.
- You might need low modeling uncertainty (e.g. very fine grid resolution).

TSHA will develop guidance on sources and their usage

Are you interested in contributing to the tsunami sources special interest group?



Scan here to complete our community interest survey

To receive updates, please join the TSHA community listserv, here:





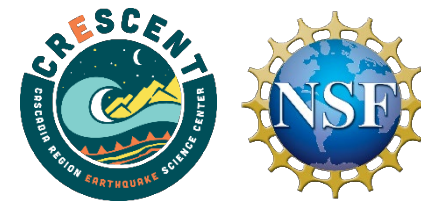
Offshore Observations (OO) Special Interest Group Update

presented by
Dr. Harold Tobin (University of Washington)

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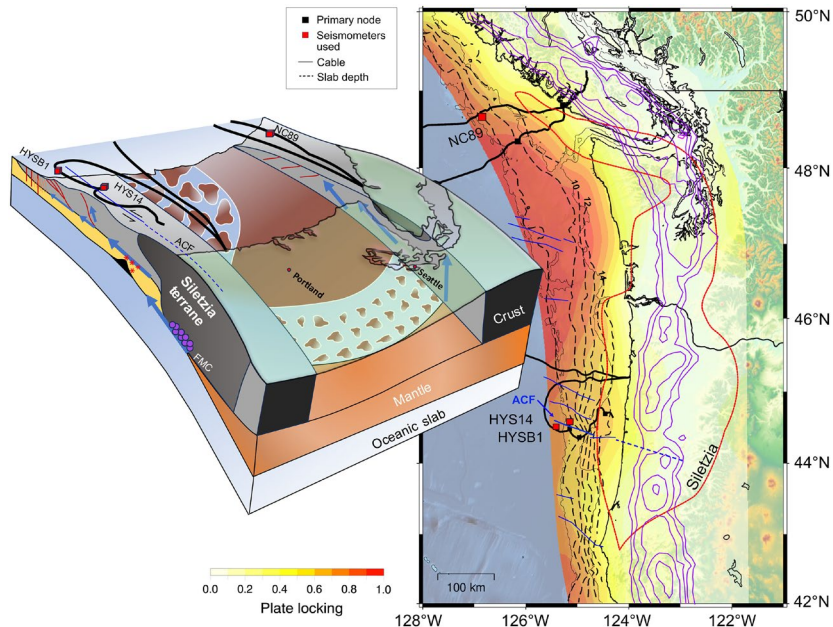


Offshore Observations SIG



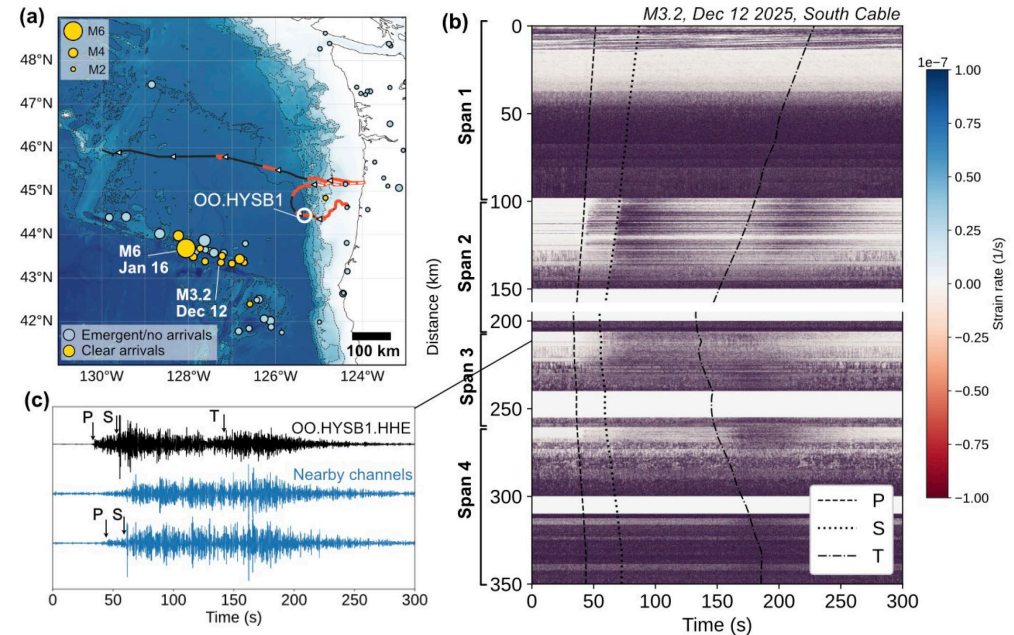
- 60 person workshop held in Oct 2025
- Major new infrastructure and science using offshore cables
- This work will directly contribute to improved earthquake and tsunami early warning, and to scenarios for impacts

Transient slip events detected offshore for 1st time



Kidiwela et al., Science Advances, 2026

First demonstration of long-distance fiber optic earthquake detection in CSZ



Krauss et al., preprint, 2026



GROUND FAILURE

Special Interest Group Update

presented by
Dr. Ben Leshchinsky (Oregon State University)

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Ground Failure in Cascadia

- Ground failure (landslides, liquefaction) will affect emergency access following the earthquake.
- Planning for ground failure scenarios enhances resilience and emergency response (takeaway from workshop).
- Key to these scenarios is identifying:
 - Existing unstable slopes
 - Liquefaction-prone deposits
 - Terrain susceptible to landslides
 - Vulnerable infrastructure and communities
- This information spans state, international borders.



Ground Failure Viewer

- Created a “one-stop shop” for Ground Failure data that includes CA, OR, WA and BC.
- Populated with landslide data from Geo. Surveys, seismic and precipitation data.
- Community space to share maps on predicted ground failure.
- Downloadable data and interactive viewer serve as basis for expansion, scenario-based planning exercises.

<https://cascadiaquakes.org/ground-failure/>

