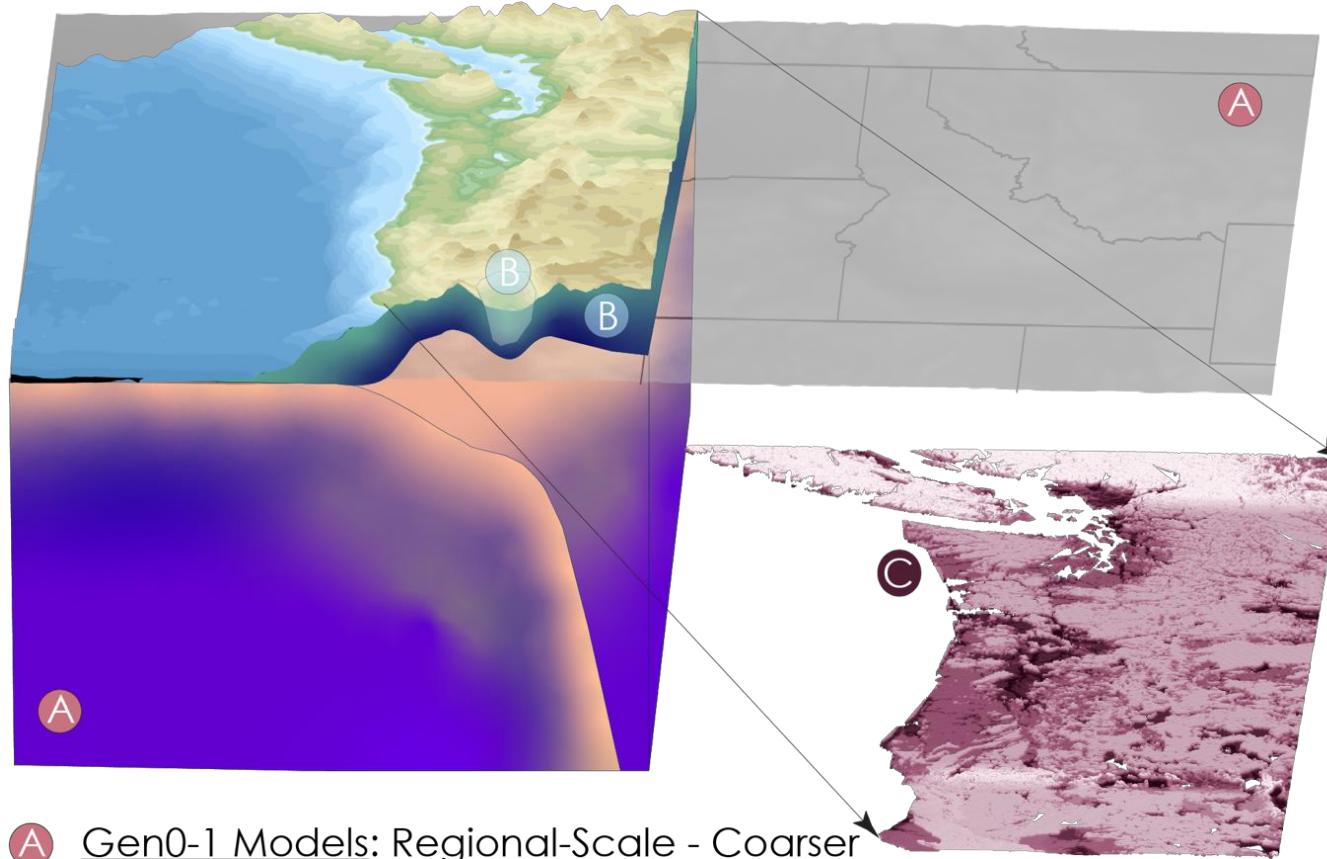


# Supplementing the shallow CRESCENT CVM: High-Resolution Sedimentary and Shallow Crustal Structure for Ground Motion Studies from Adjoint Tomography



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**CRESCENT CVM Working Group**  
GMM Topical Workshop #2  
29 January 2026

# CRESCENT CVM workflow



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

## Motivation/Details

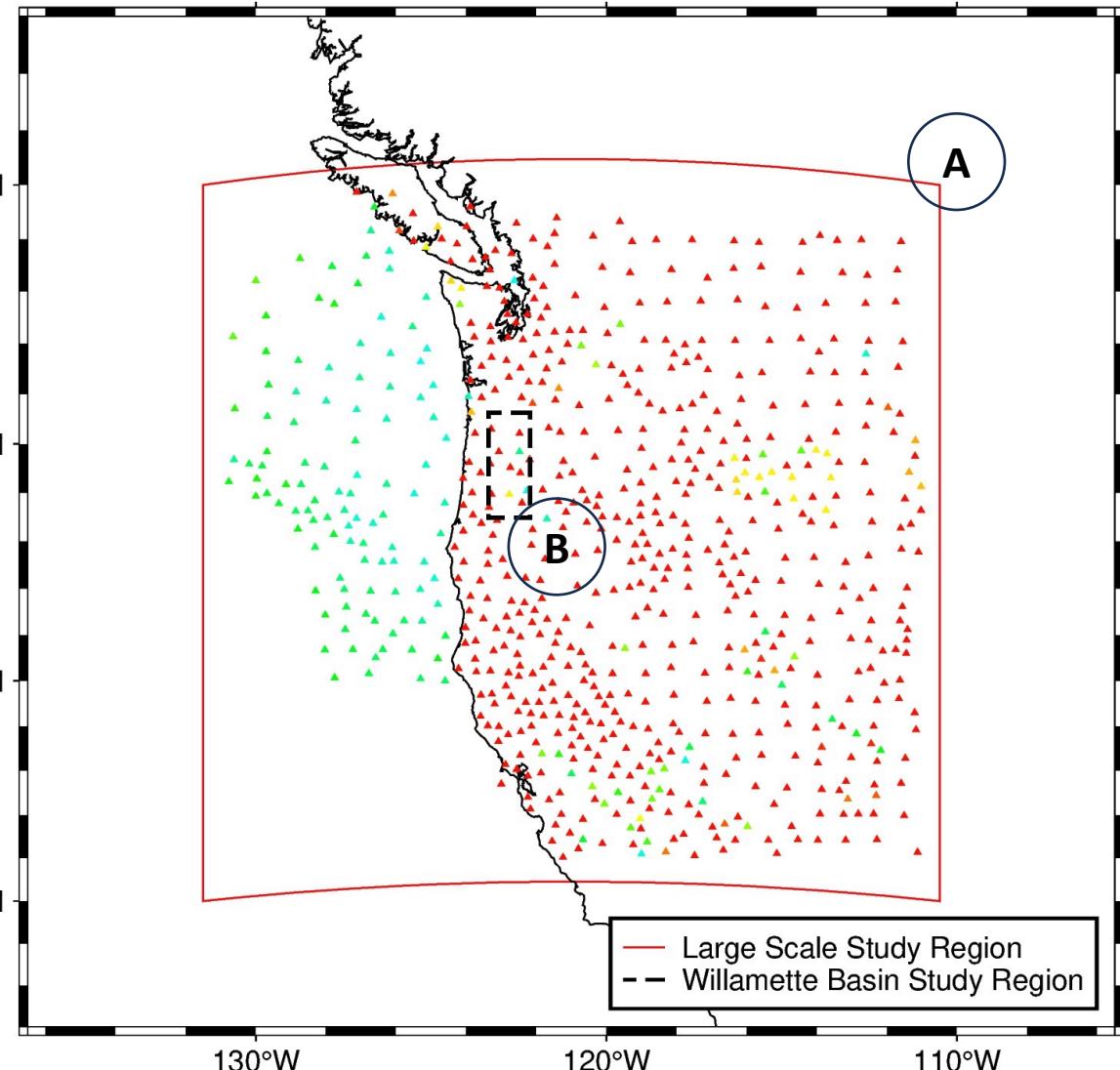
- Complementary to CFM and other crustal-scale efforts
- Key link between tectonic and geotech scales for better GMM
- We promised the NSF...
- $V_p$ ,  $V_s$ , density, NO attenuation
- Focus areas include basins and population centers

## THIS STUDY

*Sahakian et al. (in revision)*

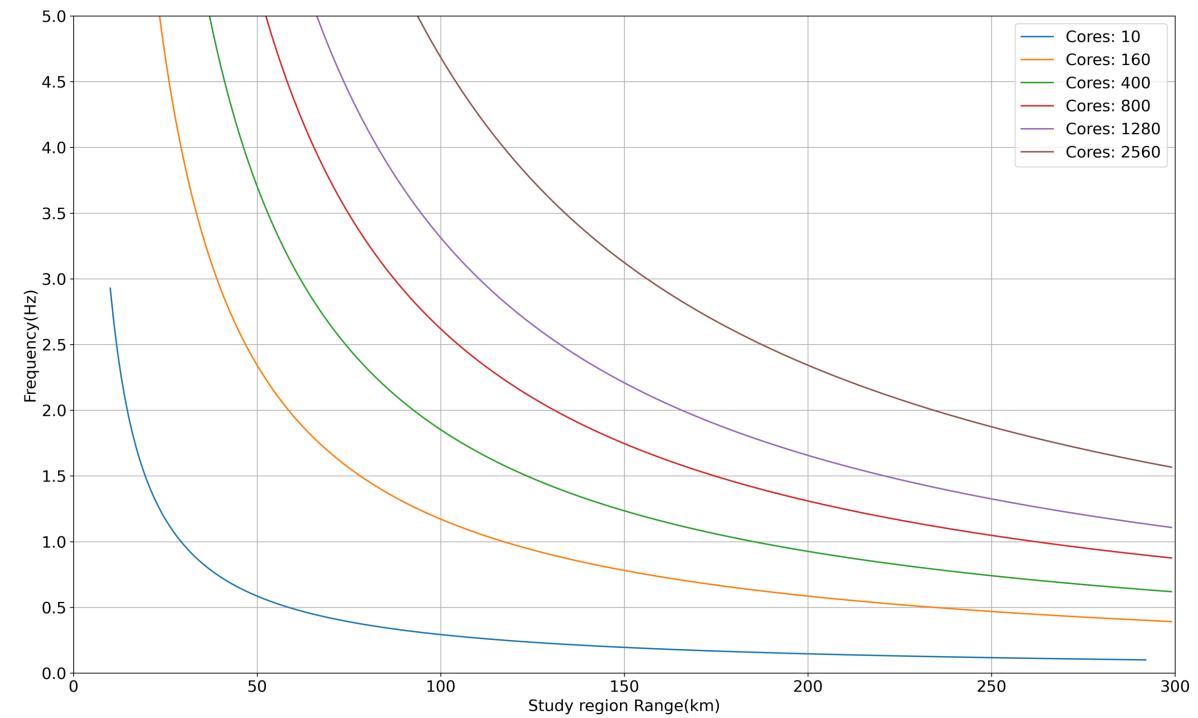
**Low to High Wavenumber, Regional to Local Scale.**

# Tractable Scales



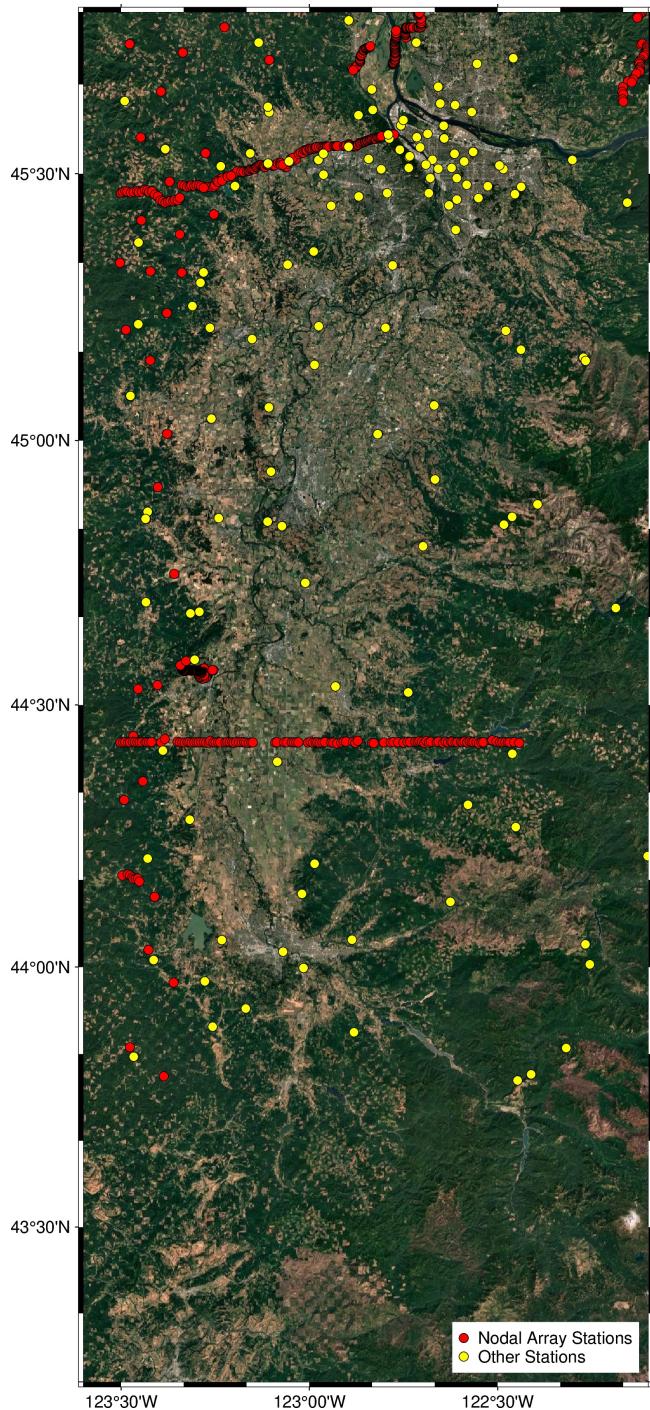
**A = CVM v0-1**

**B = First focus area in CVM v2**



**Data density not equal everywhere + higher wavenumber = more computing power**

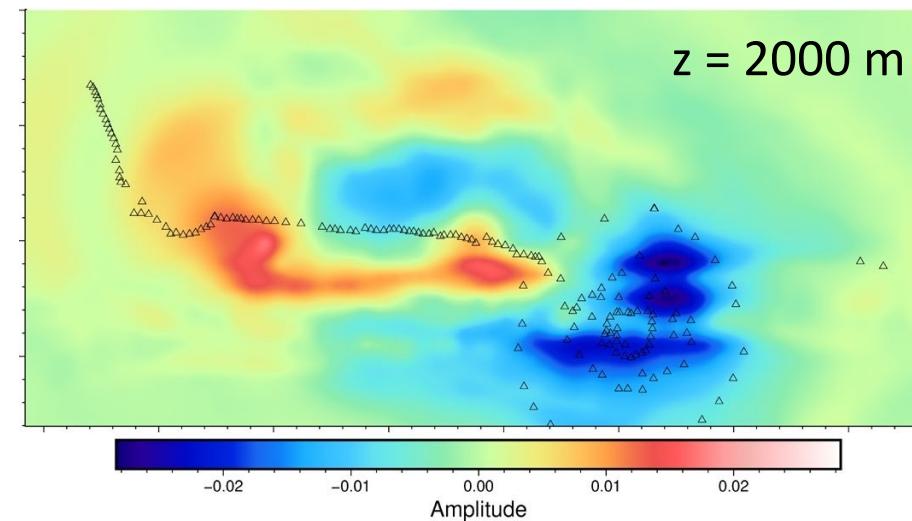
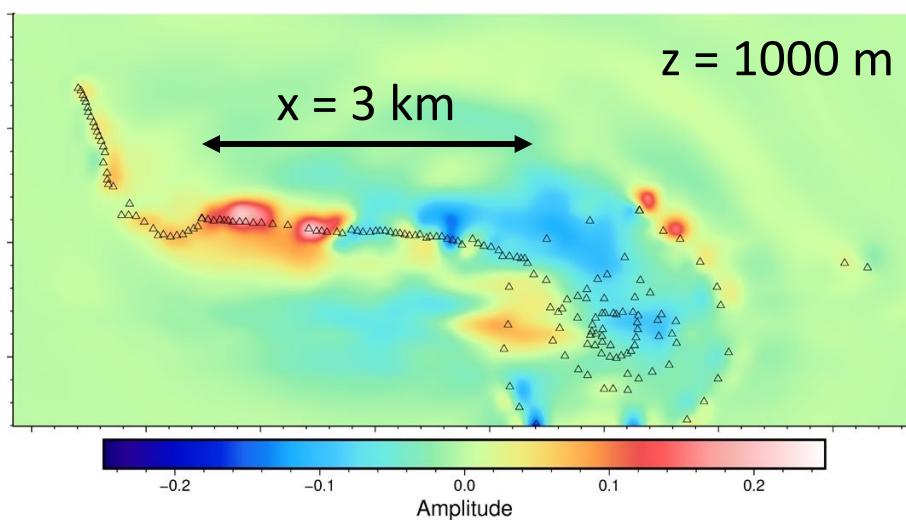
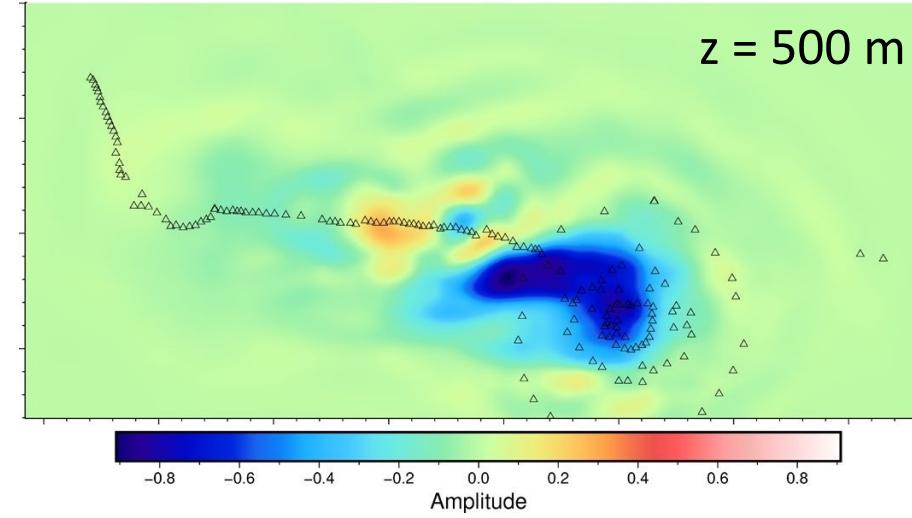
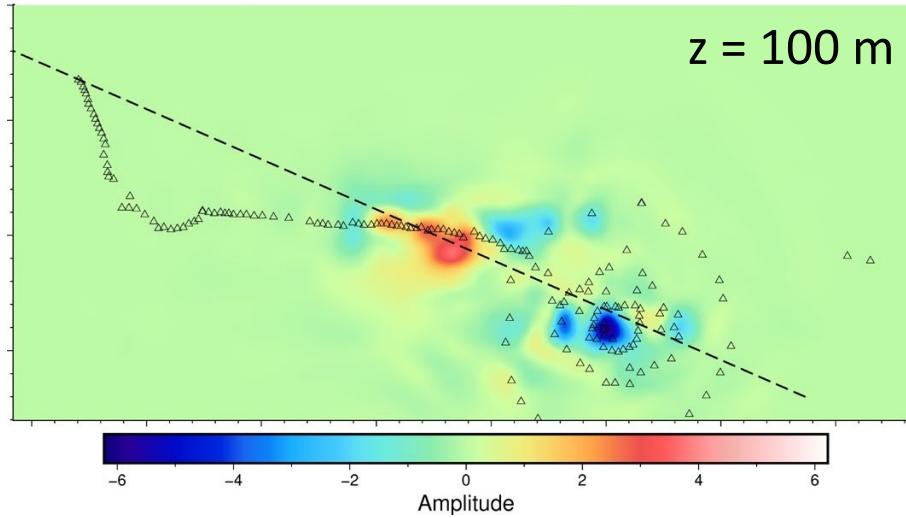
# Willamette Valley and Basin



- ~100 km by ~200 km area
- Require ~1000 CPU Cores
- Broadband, SGM and nodal data (3C where available)
- 2000-present
- Data down-sampled to 20 sps
- Starting with ambient noise (aiming to fit 1-2 Hz)
- Finest mesh size around Portland = ~0.5 – 1 km
- Using earlier CVM model iterations as starting model
- Local EQ and other sources (blasts) incorporated later

**Parameters for imaging the mid/upper crust w/  
adjoint/full-waveform techniques**

# Modified SPECFEM3D\_Cartesian



*S-wave velocity kernel  
123 virtual source  
Corvallis nodal array  
Noise GFs (<2 Hz)*

New modelling framework operational and ready for multi-scale multi-type data

# Ongoing Work/Challenges

- Access to Anvil (Purdue) via NSF ACCESS
- Data downloaded and being “cleaned”
- Cross-correlations and (robust) stacking ongoing
- 20 sps data and related products constitute 10's Tb
- Stay tuned for model updates (next couple of months)!
- Suggestions on how to deal with model uncertainty?