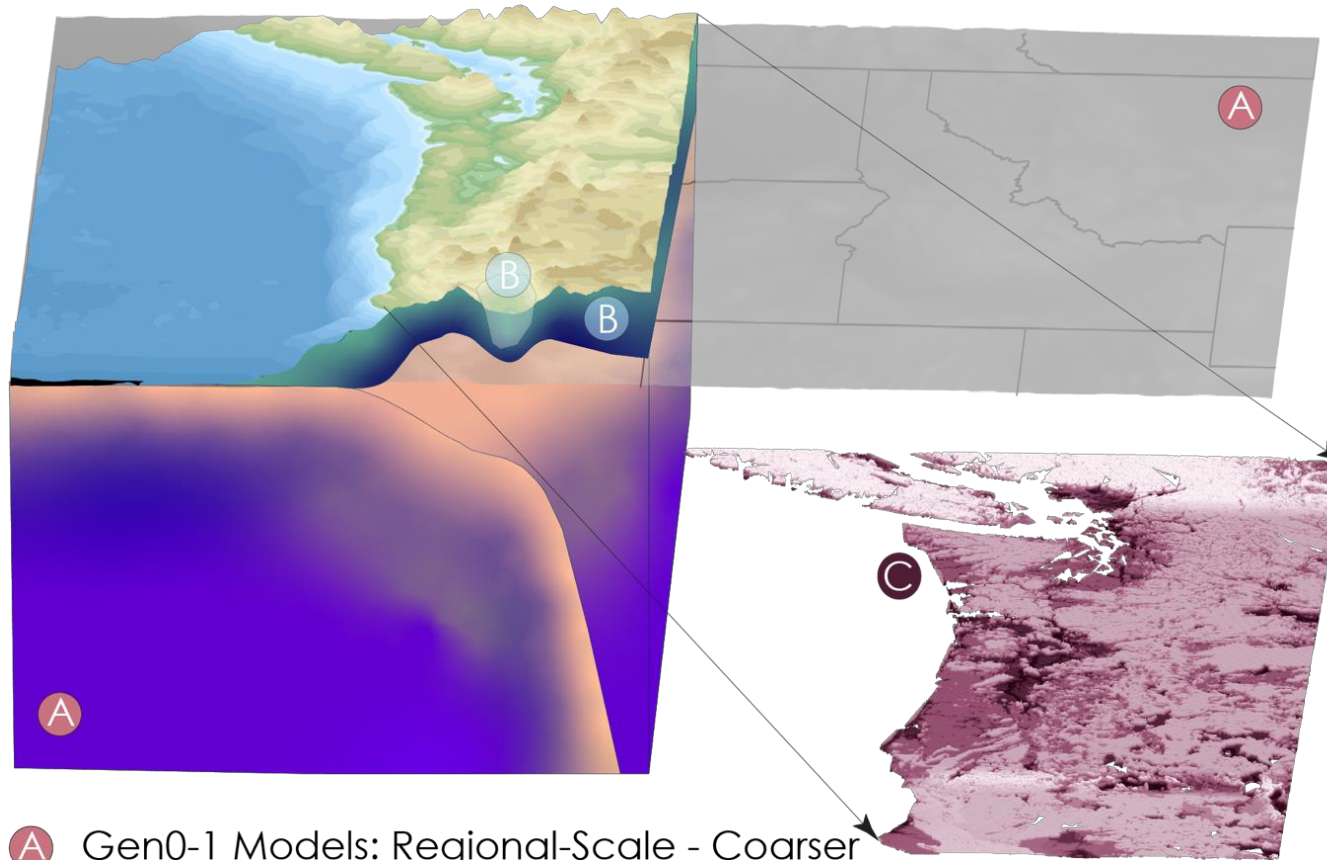


Supplementing the shallow CRESCENT CVM: High-Resolution Sedimentary and Shallow Crustal Structure for Ground Motion Studies from Adjoint Tomography



Pieter-Ewald Share & Zhengyang Zhou
CRESCENT CVM Working Group
GMM Topical Workshop #2
29 January 2026

CRESCENT CVM workflow



- 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

Motivation/Details

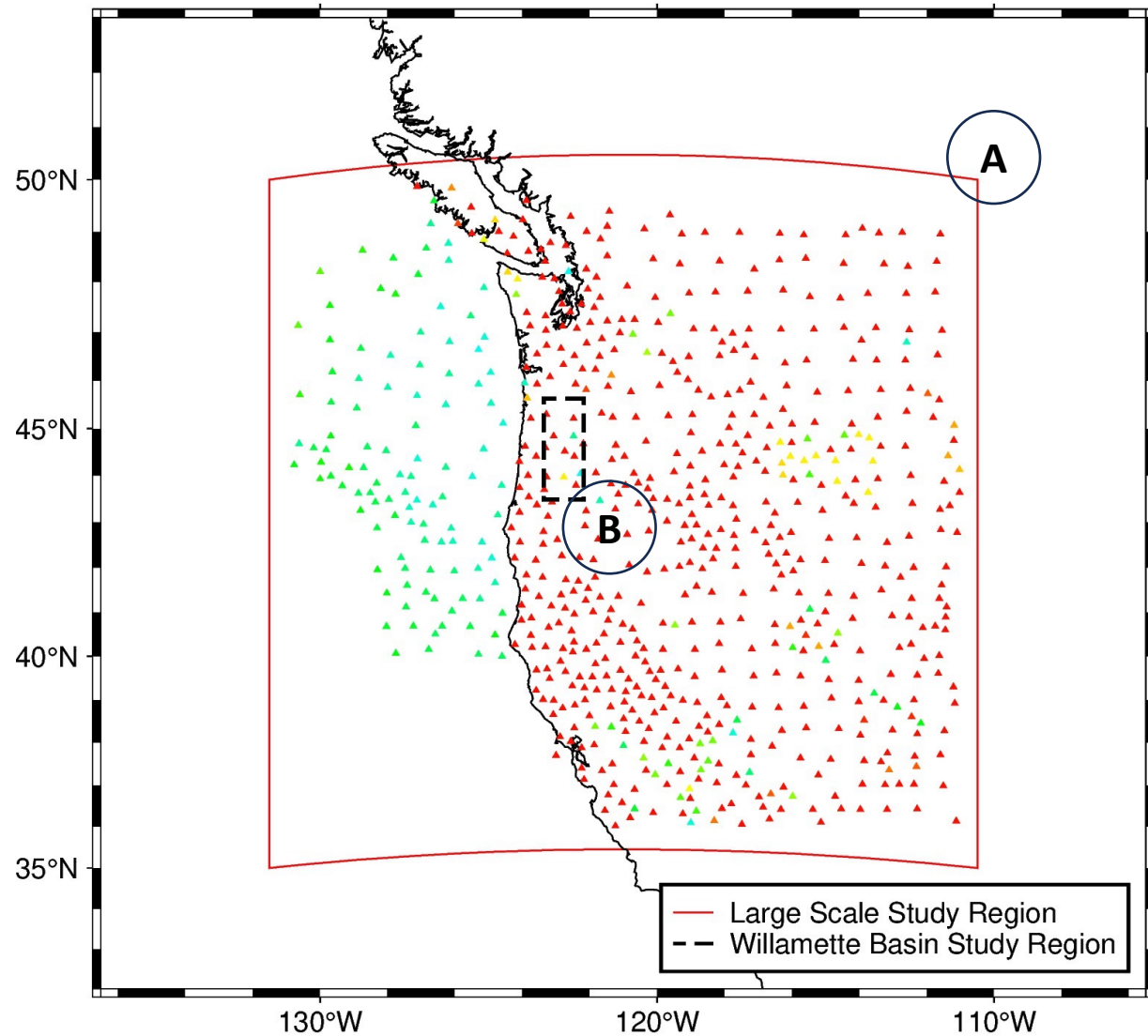
- Complementary to CFM and other crustal-scale efforts
- Key link between tectonic and geotech scales for better GMM
- We promised the NSF...
- Vp, Vs, density, NO attenuation
- Focus areas include basins and population centers

THIS STUDY

Sahakian et al. (in revision)

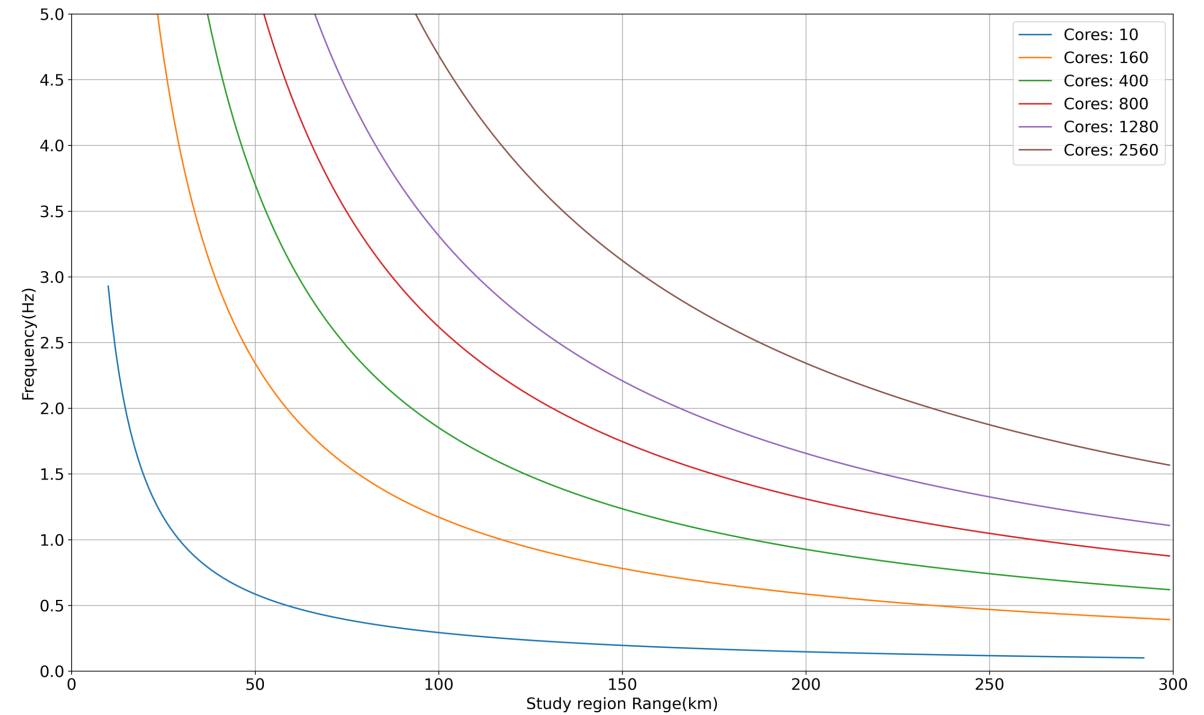
Low to High Wavenumber, Regional to Local Scale.

Tractable Scales



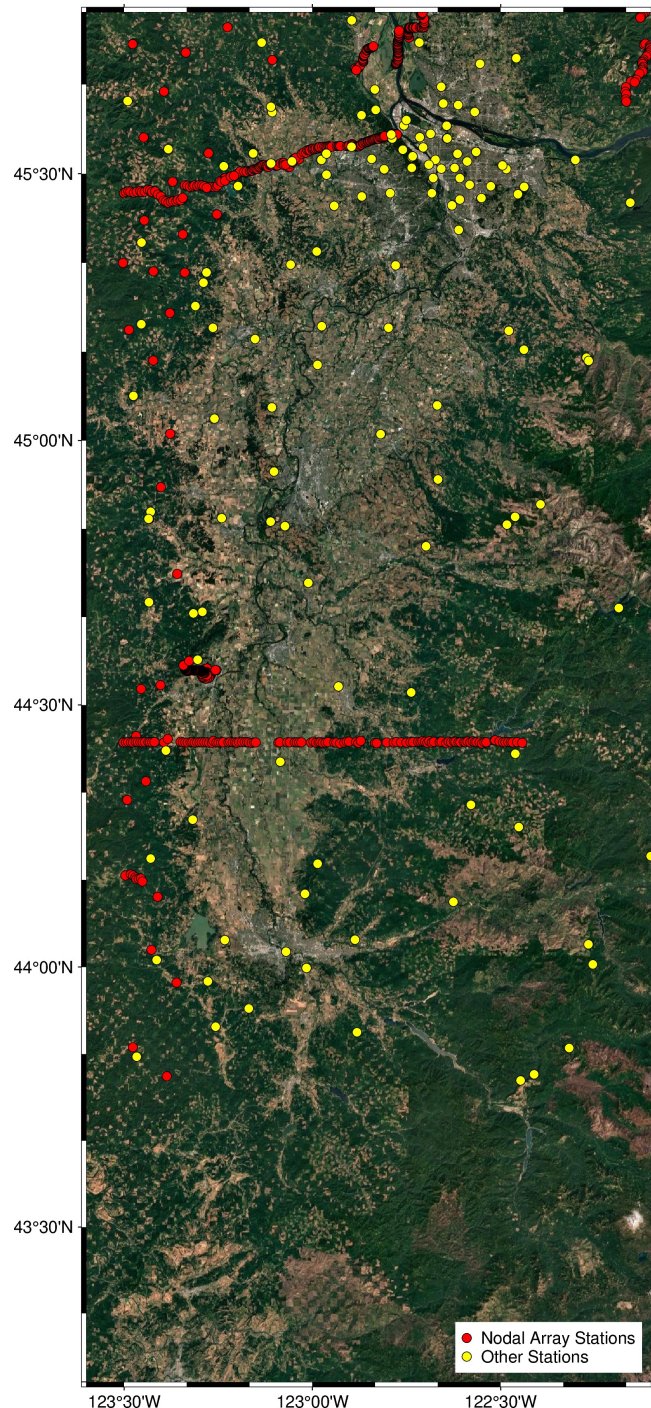
A = CVM v0-1

B = First focus area in CVM v2



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

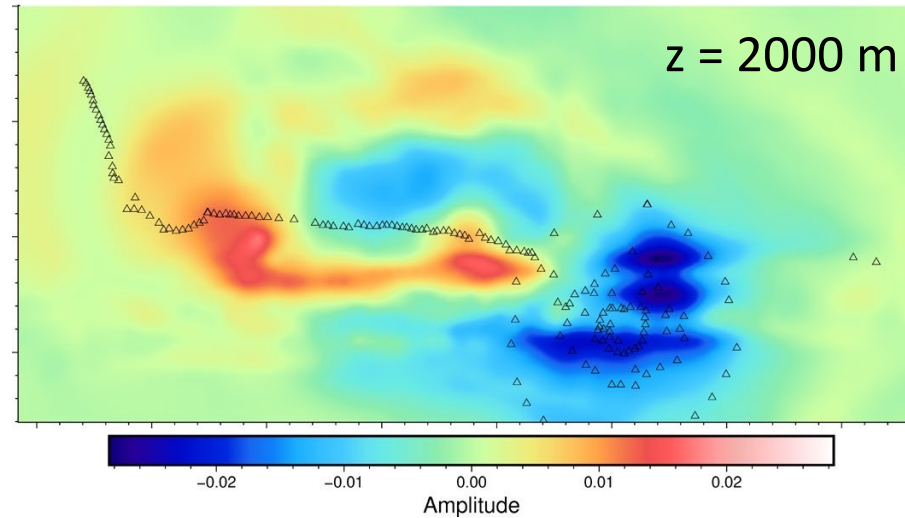
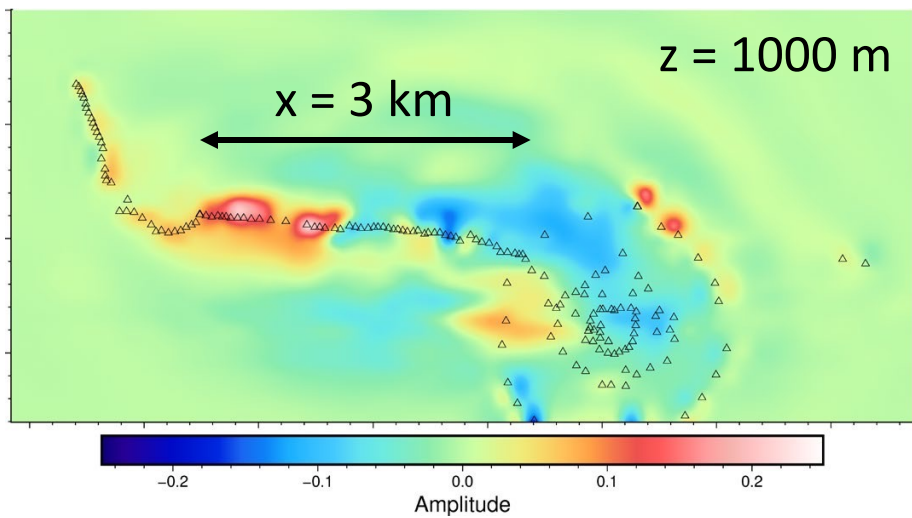
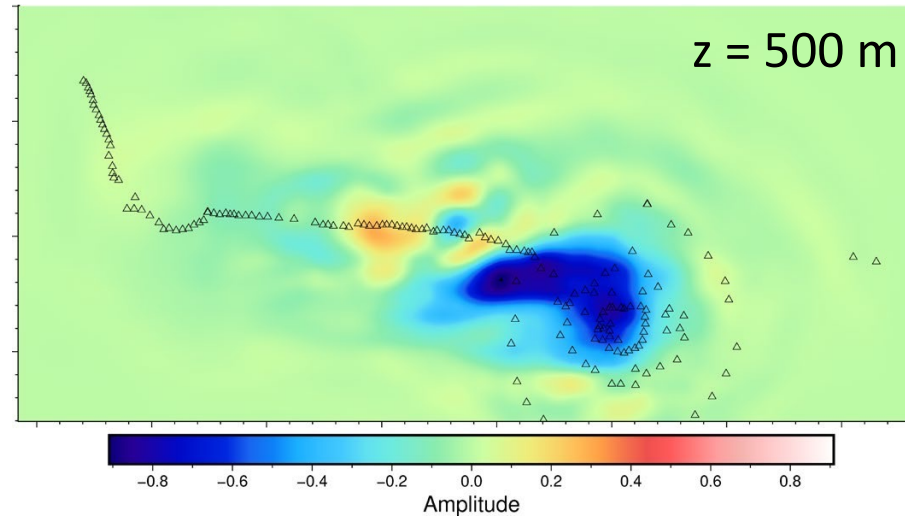
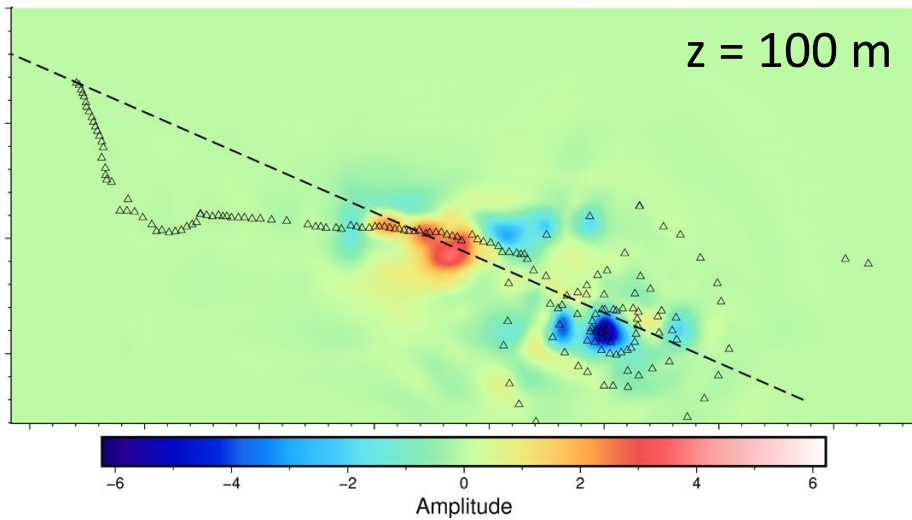
Willamette Valley and Basin



- ~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?