Deterministic CVM Features Are Required for High-Frequency (> 1 Hz) Simulations

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Research Priorities: Validation / Computation

- Deterministic velocity contrasts (faults, damage zones, folds, lithologic boundaries, etc.) are necessary for modeling higher frequency (>1 Hz) ground motions
- Tomography process has blurred out many of these features in CVM-S4.26
- CVM-H (v15.10?) has relatively better resolution of these features
Example: Simulation of 1933 Long Beach EQ

- Same rupture model inserted into both CVMs
- Maximum frequency of 2 Hz (grid spacing = 40 m, $V_{\text{min}} = 400$ m/s, ELY-GTL)
- Spatial coherence of wave field is much weaker (more realistic?) in CVM-H than CVM-S4.26
Future Research Directions

How can the representation of deterministic features be improved in the CVMs?

- **Consistency with CFM:** Structures within the CVMs should be implemented in a manner that is consistent with the fault representation in the CFM, particularly, fault bounded velocity contrasts.

- **Incorporation of damage zones:** Where identified, near-surface fault damage zones (manifest as low seismic velocity) should be included in the CVM description.

- **Sediment velocity variability:** Constraining the lateral and vertical distribution of seismic velocity within the basin sediments using borehole and seismic data (dense arrays).

- **Near-surface material:** Better description of the lateral and vertical distribution of seismic velocity within the upper ~1 km (beyond GTL).

- **Balancing deterministic and stochastic:** Need to be careful to not double count features.