

2025 SCEC Final Report, Project #25209

**Making California-region seismic velocity models accessible in multiple
formats**

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1. Abstract

A set of existing seismic velocity models for different parts of California have been assembled and converted into multiple formats. Five of these models have been integrated into the SCEC CEM (UCVM) archive with assistance from SCEC staff. Workflows for additional format conversions have been developed, and work on disseminating those workflows will continue after this project ends.

2. Research Goals

The main goals of my work under SCEC award #25209 are to assemble a set of existing seismic velocity models for different parts of California and convert them into multiple formats, integrate these models into the SCEC CEM (UCVM) archive with assistance from SCEC staff, and provide them in multiple formats on an additional accessible, citable website.

3. Methodology

Workflows were developed to take 3D seismic velocity models in their original published or otherwise disseminated formats and reformat them into common or other otherwise user-friendly formats.

4. Results Achieved

Multiple workflows have been developed, most importantly including one that produces models that can be integrated into the SCEC CVM archive. Other output formats for which workflows have been developed include (1) the netCDF and GeoCSV model formats for EarthScope's Earth Model Collaboration, (2) the input model format for the seismic wave propagation code SW4, (3) the input model formats for widely used tomographic inversion codes simul2023 and tomoDD,

The models that have been successfully integrated into the SCEC CVM archive and are now available either through the SCEC Unified Community Velocity Model (UCVM) software framework or through the SCEC Community Velocity Model Explorer are:

- (1) Thurber et al. (2009) 3D P-wave velocity (V_p) model for northern California,
- (2) Lin et al. (2010) statewide 3D V_p and S-wave velocity (V_s) models,
- (3) Doody et al. (2023) CANVAS Western US 3D V_p and V_s models,
- (4) Guo et al. (2025) San Francisco Bay area 3D V_p and V_s models obtained with the support of a USGS award, and
- (5) Zeng et al. (2016) 3D V_p and V_s models of the greater Parkfield region.

An example of a model slice at depth for the Guo et al. (2025) model created with the SCEC Community Velocity Model Explorer is shown in Figure 1.

Work will continue after the end date of this project to integrate additional models into the SCEC UCVM.

5. Significance of Results

This work has led to 5 additional 3D seismic velocity models covering different parts of California and vicinity being incorporated into the SCEC UCVM, and creating workflows to add more in the future. Workflows were also created to convert seismic velocity models between different common formats. These workflows will be disseminated after further testing.

6. Intellectual Merit

Having ready access to more seismic velocity models facilitates efforts at wavefield simulation and provides models that can be used for model merging work.

7. Broader Impact

The use of wavefield simulations with high-quality seismic velocity models contributes to earthquake hazard information, and our work makes such models readily available to the community.

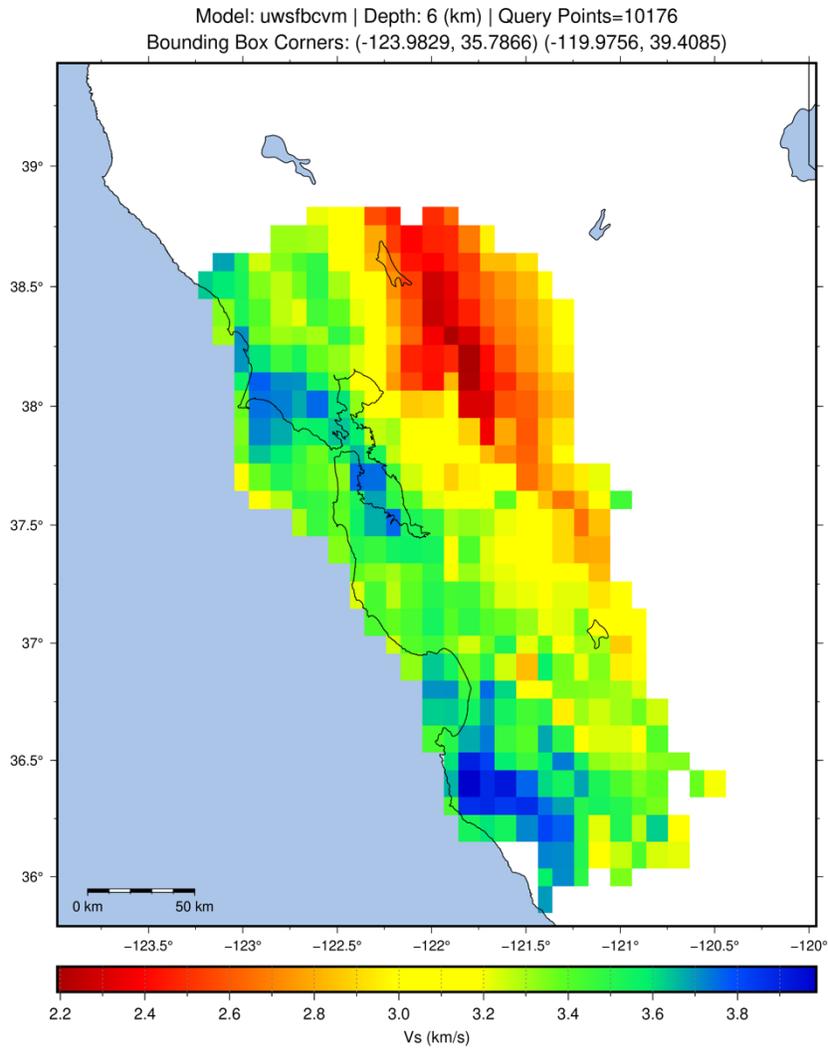


Figure 1. Horizontal slice through the Guo et al. (2025) Vs model for the San Francisco Bay area plotted using the SCEC Community Velocity Model Explorer tool.

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