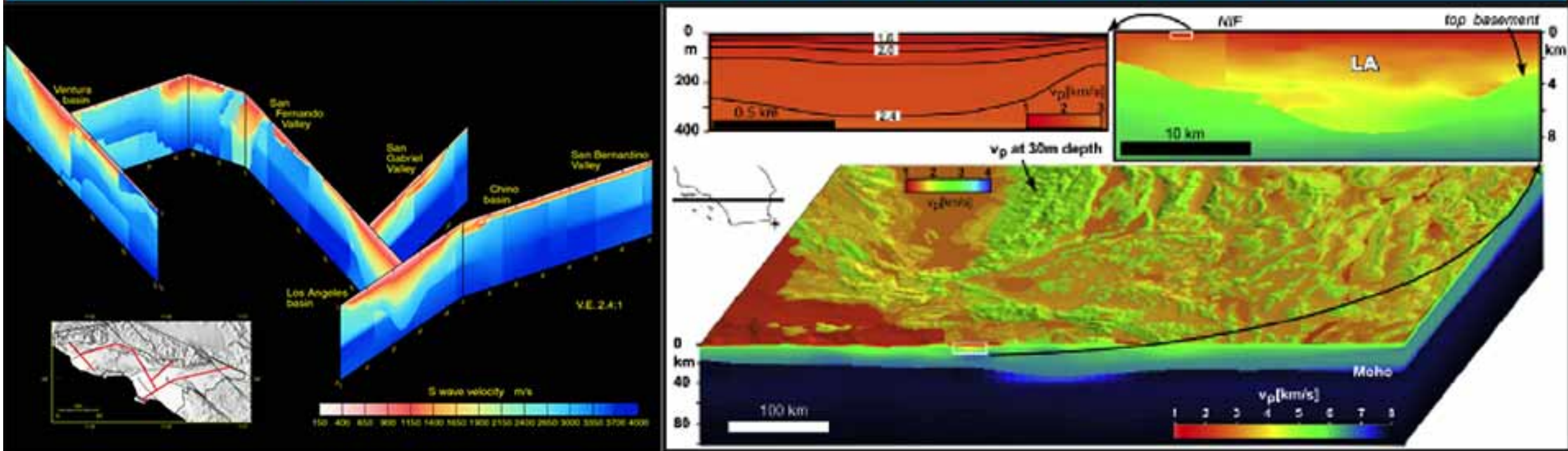


SCEC Workshop: Multi-scale seismic velocity models—Imaging and validation studies

SCEC CVM WORKSHOP, SEPTEMBER 1, 2020



Conveners: Carl Tape, Cliff Thurber, and Yehuda Ben-Zion

APPLICATION CLOSED

It is SCEC policy to foster harassment-free environments wherever our science is conducted. By participating in this SCEC-supported event, participants agree to abide by the SCEC Activities Code of Conduct.

WORKSHOP PLAN AND GOALS

- Showcase recent developments in tomographic methods and applications relevant to the development of SCEC CVMs
- Produce revised list of prioritized action items for the SCEC CVM TAG
- Develop research priorities for the 2021 SCEC Science Plan
- Facilitate coordination of proposals in response to the 2021 SCEC Science Plan and other funding opportunities

The first set of action items are proposed to be completed by the end of SCEC5:

- Develop end-to-end full 3D tomography (F3DT) code and workflow
- Develop an approach and tools for integrating new models into current models and examining quality of the modified model for validation (through data analyses and 3D visualization of model properties)
- Develop strategies for dealing with topography in creating, modifying, or comparing models
- Make detailed comparisons between the current CVM-S and CVM-H models (velocity values, depths to key isosurfaces, power spectra, etc.)
- Develop and share SCEC ambient noise Green's function results (from SCEC's Stanford and UW-Madison teams and other sources)
- Relocate earthquakes in the current CVM-S and CVM-H models for Community Fault Model assessment
- Submit decimated versions of the current CVM-S and CVM-H models to the IRIS EMC

The second set of action items are somewhat lower in priority and may be initiated but likely not completed during SCEC5:

- Develop approaches for assessing model uncertainty
- Explore approaches for determining near-surface structure and fine-scale heterogeneity
- Explore strategies for imbedding high-resolution near-surface structure and fault zone models into CVMs
- Pursue the potential of joint geophysical inversions to improve CVMs
- Establish libraries of (1) data used to develop SCEC CVMs and (2) real and synthetic Green's functions
- Incorporate Salton Sea experiment data into next round of model updates
- Work to increase availability of continuous strong motion data

TUESDAY, SEPTEMBER 1, 2020

All times listed in the agenda below are Pacific Time Zone.

08:00 - 08:10 Workshop, Introduction, Goals

Cliff Thurber

08:10 - 10:15 **Session 1: Multiscale models—estimation and merging**

Moderator: *Carl Tape* Reporter: *Victor Tsai*

08:10 - 08:30 Practical and emerging methods for resolution analysis and uncertainty quantification

Andreas Fichtner

08:30 - 08:50 The Collaborative Seismic Earth Model

Dirk-Philip van Herwaarden

08:50 - 09:10 Combining elastic models of different scales: a homogenization perspective

Yann Capdeville

09:10 - 09:30 Discussion

All

09:30 - 09:45 UCVM Development and Low-frequency Validation of Hybrid Earth Models near the Southern San Andreas *Rasheed Ajala*

09:45 - 10:00 Parsimoniously introducing high-resolution local updates into the SCEC CVMs using a level-set approach *Jack Muir*

10:00 - 10:15 Discussion

All

10:15 - 10:45 *Break*

10:45 - 12:00 **Session 2: Regional models**

Moderator: *Christine Goulet* Reporter: *Pieter-Ewald Share*

10:45 - 11:00 Modular sedimentary basin models in California to support next generation CVM developments

Andreas Plesch

11:00 - 11:15 Regional seismic velocity models for Southern California based on travel time tomography with Poisson Voronoi cells parameterization

Hongjian Fang

11:15 - 11:30 Earthquake Ground Motion Simulations and 3D Earth Models in Northern California and Beyond

Artie Rodgers

11:30 - 11:45 Validation of seismic velocity models in southern California with full-waveform simulations

Yang Lu

11:45 - 12:00 Discussion

All

12:00 - 13:30 **Lunch break** (and viewing of pre-recorded talks)

13:30 - 15:30 Session 3: Local and specialized models and shallow crust

Moderator: Cliff Thurber Reporter: Ben Heath

- 13:30 - 13:45 Modeling 3D seismic velocity structure in the region of the 2019 M7.1 Ridgecrest, CA earthquake with traveltimes tomography based on dense rapid-response recordings of the aftershock sequence *Malcolm White*
- 13:45 - 14:00 Joint inversion of Rayleigh wave Phase Velocity, Ellipticity, and Receiver Function: Expanding to the Shallower and Deeper Crust *Elizabeth Berg*
- 14:00 - 14:15 Body-Wave Polarization for Constraining Near-Surface Structure *Sunny Park*
- 14:15 - 14:30 Effects of Shallow Velocity Reductions on Three-Dimensional Propagation of Seismic Waves *Alan Juarez*
- 14:30 - 14:45 Discussion *All*
- 14:45 - 15:30 Group Discussion (on Sessions 1-3 and Lightning Talks)**
- 15:30 - 16:00 *Break*

16:00 - 17:00 Session 4: Future research directions

Moderator: Yehuda Ben-Zion Reporter: Cliff Thurber

- 16:00 - 16:10 Geomodelgrids: A multi-scale storage scheme and API for gridded georeferenced models *Brad Aagaard*
- 16:10 - 16:20 An automated workflow for adjoint tomography applied to the North Island, New Zealand *Bryant Chow*
- 16:20 - 17:00 Discussion
- Review action items from previous workshops *Cliff Thurber*
 - Model archival and dissemination (e.g., IRIS EMC) *All*
 - Validation: benchmark data sets and CME machinery *All*
 - FWI platform for improvements at long length scales (>1s period) *All*
 - Strategy for developing multi-scale models needed for high-frequency simulations *All*
 - Future research plans for CVM TAG *Carl Tape / Cliff Thurber*
- 17:00 *Adjourn*

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