2013 SCEC Annual Meeting

Hilton Palm Springs, California
8-11 September 2013

SCEC
an NSF + USGS center
Welcome to Palm Springs!
Welcome to Palm Springs!

Mon 102° 78°
Tue 100° 79°
Wed 101° 81°
Goals of the Annual Meeting

• Discuss SCEC collaborative research
  – Learn about new advances in earthquake science
  – Share research results and collaboration plans

• Assess progress on key SCEC4 objectives
  – Special Fault Study Areas
  – Community Geodetic Model & Community Stress Model
  – Earthquake Engineering Implementation Interface
  – Virtual Institute for the Study of Earthquake Systems (VISES)

• Provide input to the 2013 annual science plan
  – PC to finalize annual plan by Oct 1
  – Review SCEC4 milestones

• Have some fun!
SCEC Member Institutions (Sept 1, 2013)

17 Core Institutions and Representatives

<table>
<thead>
<tr>
<th>USC, Lead</th>
<th>Harvard</th>
<th>UC Los Angeles</th>
<th>UC Santa Cruz</th>
<th>USGS Pasadena</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tom Jordan</td>
<td>Jim Rice</td>
<td>Peter Bird</td>
<td>Emily Brodsky</td>
<td>Rob Graves</td>
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<tr>
<td>Caltech</td>
<td>MIT</td>
<td>UC Riverside</td>
<td>UNR</td>
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<td>Nadia Lapusta</td>
<td>Tom Herring</td>
<td>David Oglesby</td>
<td>Glenn Biasi</td>
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<td>CGS</td>
<td>SDSU</td>
<td>UC San Diego</td>
<td>USGS Golden</td>
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<td>Chris Wills</td>
<td>Steve Day</td>
<td>Yuri Fialko</td>
<td>Jill McCarthy</td>
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<td>Columbia</td>
<td>Stanford</td>
<td>UC Santa Barbara</td>
<td>USGS Menlo Park</td>
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<tr>
<td>Bruce Shaw</td>
<td>Paul Segall</td>
<td>Ralph Archuleta</td>
<td>Ruth Harris</td>
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</tbody>
</table>

37 Domestic Participating Institutions and Representatives

<table>
<thead>
<tr>
<th>Appalachian State</th>
<th>Colorado Sch. Mines</th>
<th>Smith</th>
<th>U Illinois</th>
<th>U Wisconsin Madison</th>
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</thead>
<tbody>
<tr>
<td>Scott Marshall</td>
<td>Edwin Nissen</td>
<td>John Loveless</td>
<td>Karin Dahmen</td>
<td>Clifford Thurber</td>
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<tr>
<td>Arizona State</td>
<td>Cornell</td>
<td>SUNY at Stony Brook</td>
<td>U Kentucky</td>
<td>URS Corporation</td>
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<td>J Ramon Arrowsmith</td>
<td>Rowena Lohnman</td>
<td>William Holt</td>
<td>Sean Bemis</td>
<td>Paul Somerville</td>
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<td>Brown</td>
<td>Georgia Tech</td>
<td>Texas A&amp;M</td>
<td>U Massachusetts</td>
<td>Utah State</td>
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<td>Terry Tullis</td>
<td>Zhigang Peng</td>
<td>Judith Chester</td>
<td>Michele Cooke</td>
<td>Susanne Janecke</td>
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<tr>
<td>CalPoly Pomona</td>
<td>Indiana</td>
<td>U Alaska Fairbanks</td>
<td>U Michigan Ann Arbor</td>
<td>Utah Valley</td>
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<td>Jasha Polot</td>
<td>Kaj Johnson</td>
<td>Carl Tape</td>
<td>Eric Hetland</td>
<td>Nathan Toke</td>
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<tr>
<td>CSU Fullerton</td>
<td>JPL</td>
<td>UC Berkeley</td>
<td>Margaret Boettcher</td>
<td>WHOI</td>
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<tr>
<td>David Bowman</td>
<td>Andrea Donnellan</td>
<td>Roland Bürgmann</td>
<td>U Oregon</td>
<td>Jeff McGuire</td>
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<td>CSU Long Beach</td>
<td>Oregon State</td>
<td>UC Davis</td>
<td>Ray Weldon</td>
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<td>Andrew Meigs</td>
<td>Michael Oskin</td>
<td>U Texas El Paso</td>
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<td>Penn State</td>
<td>UC Irvine</td>
<td>Bridget Smith-Kanter</td>
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<td>Sally McGill</td>
<td>Eric Kirby</td>
<td>Lisa Grant Ludwig</td>
<td>U Texas Austin</td>
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<td>Carnegie Mellon</td>
<td>Purdue</td>
<td>U Cincinnati</td>
<td>Lewis Owen</td>
<td>Whitney Behr</td>
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<td>Jacobo Biaiek</td>
<td>Andrew Freed</td>
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10 International Participating Institutions

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<tr>
<th>Academia Sinica (Taiwan)</th>
<th>ERI Tokyo (Japan)</th>
<th>Nat’l Central U (Taiwan)</th>
<th>U Western Ontario (Canada)</th>
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<tr>
<td>CICESE (Mexico)</td>
<td>ETH Zürich (Switzerland)</td>
<td>Nat’l Chung Cheng (Taiwan)</td>
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<tr>
<td>DPRI Kyoto (Japan)</td>
<td>IGNS (New Zealand)</td>
<td>Nat’l Taiwan U (Taiwan)</td>
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</table>
SCEC Member Institutions (Sept 1, 2013)

For those of you attending this meeting who don’t see your institution on this list, please note that it’s easy to apply.

We just need a letter from a cognizant official (e.g., your department chair or dean) that requests this status and appoints an institutional representative who will act as the point-of-contact with SCEC.

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- Appalachian State
- Scott Marshall
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- Jasha Polet
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- David Bowman
- CSU Long Beach
- Nate Onderdonk
- CSU San Bernardino
- Sally McGill
- Carnegie Mellon
- Jacobo Bielak
- Appalachian State
- Colorado Sch. Mines
- Edwin Nissen
- Cornell
- Rowena Lohman
- Georgia Tech
- Zhigang Peng
- Indiana
- Kaj Johnson
- JPL
- Andrea Donnellan
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- Eric Kirby
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- William Holt
- Texas A&M
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- U Alaska Fairbanks
- Carl Tape
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- DPRI Kyoto (Japan)
- IGNS (New Zealand)
- Nat’l Taiwan U (Taiwan)
Core Institutions & Board of Directors

University of Southern California
    Tom Jordan, Chair

California Institute of Technology
    Nadia Lapusta, Vice-Chair

California Geological Survey
    Chris Wills

Columbia University
    Bruce Shaw

Harvard University
    Jim Rice

Massachusetts Institute of Technology
    Tom Herring

San Diego State University
    Steve Day

Stanford University
    Paul Segall

University of California, Los Angeles
    Peter Bird

University of California, Riverside
    David Oglesby

University of California, San Diego
    Yuri Fialko

University of California, Santa Barbara
    Ralph Archuleta

University of California, Santa Cruz
    Emily Brodsky

University of Nevada, Reno
    Glenn Biasi

U.S. Geological Survey, Golden
    Jill McCarthy (liaison, non-voting member)

U.S. Geological Survey, Menlo Park
    Ruth Harris (liaison, non-voting member)

U.S. Geological Survey, Pasadena
    Rob Graves (liaison, non-voting member)

At-Large Member
    Judi Chester (TAMU)

At-Large Member
    Roland Burgmann (UCB)
Welcome Christine Goulet & Max Werner!

Special Projects

Disciplinary Groups

Focus Groups

CEO Activities

SCEC4 Organization
Deputy Director, PC Chair
Greg Beroza **

Disciplinary Committees

Seismology
Egill Hauksson **
Elizabeth Cochran

Earthquake Geology
Lisa Grant Ludwig **
Mike Oskin

Tectonic Geodesy
Jessica Murray **
Dave Sandwell

Computational Science
Yifeng Cui **
Eric Dunham

Special Projects

Community Modeling Environment
Phil Maechling **

Working Group on California Earthquake Probabilities
Ned Field **

Collaboratory for the Study of EQ Predictability
Max Werner **
Danijel Schorlemmer
Deputy Director, *PC Chair*
Greg Beroza **

**Interdisciplinary Focus Groups**

**Unified Structural Representation**
John Shaw **
Brad Aagaard

**So. San Andreas Fault Evaluation**
Kate Scharer **
Ramon Arrowsmith

**EQ Forecasting and Predictability**
Jeanne Hardebeck **
Ilya Zaliapin

**Fault and Rupture Mechanics**
Judi Chester **
Jean-Paul (Pablo) Ampuero

**Stress and Deformation Over Time**
Kaj Johnson **
Thorsten Becker

**Ground Motion Prediction**
Kim Olsen **
Christine Goulet

**EQ Eng. Implementation Interface**
Jack Baker **
Jacobo Bielak
SCEC4 Organization

Special Projects
- CME
- WGCEP
- CSEP
- Broadband

Disciplinary Groups
- Earthquake Geology
- Tectonic Geodesy
- Seismology
- Computational Science

Focus Groups
- Unified Structural Representation
- Fault & Rupture Mechanics
- SoSAFE
- Stress & Deformation Over Time
- Earthquake Forecasting & Predictability
- Ground Motion Prediction

CEO Activities
- Implementation Interface
- Public Education & Preparedness
- K-14 Earthquake Education Initiative
- Experiential Learning & Career Advancement

SCEC Director Board of Directors
External Advisory Council
Southern California Earthquake Center
External Advisory Council

Jeff Freymueller, Chair
U of Alaska Fairbanks

Donna Eberhart-Phillips
U of California Davis

Farzad Naeim
John A Martin and Assoc

Gail Atkinson
U of Western Ontario

Bob Lillie
Oregon State U

John Vidale
U of Washington

Roger Bilham
U of Colorado Boulder

Kate Long
CalEMA

Andrew Whittaker
University at Buffalo

Susan Cutter
U of South Carolina

M. Meghan Miller
UNAVCO
<table>
<thead>
<tr>
<th>Center Administration</th>
<th>Communication, Education, and Outreach</th>
<th>Information Technology</th>
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<tr>
<td><strong>Associate Director</strong></td>
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<tr>
<td>John McRaney</td>
<td>Mark Benthien</td>
<td>Phil Maechling</td>
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<tr>
<td><strong>Special Projects and Events</strong></td>
<td><strong>Education Programs</strong></td>
<td><strong>Research Programmer</strong></td>
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<tr>
<td>Tran Huynh</td>
<td>Bob de Groot</td>
<td>Scott Callaghan</td>
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<td><strong>Contracts and Grants</strong></td>
<td><strong>Digital Products</strong></td>
<td><strong>Research Programmer</strong></td>
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<tr>
<td>Karen Young</td>
<td>John Marquis</td>
<td>David Gill</td>
</tr>
<tr>
<td><strong>Admin Coordinator</strong></td>
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<td><strong>Research Programmer</strong></td>
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<tr>
<td>Deborah Gormley</td>
<td></td>
<td>Masha Liukis</td>
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**Southern California Earthquake Center Staff**
AVAILABLE FOR DOWNLOAD
www.scec.org/meetings/2013am/
SCEC2013Proceedings.pdf

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SCEC Base Program

SCEC4

Authorized for funding until 2017

NSF reduction: $300K (10%)
USGS reduction: $40K (3%)
Budget Situation

• Budget present
  – USGS cut the 2013 SCEC budget by $40K relative to 2012 (3%)
  – NSF cut the 2013 SCEC budget by $300K relative to 2012 (10%)
    • final funding amount not confirmed by NSF until July
  – To meet these reductions, cuts were made to
    • Director's reserve, administration, CEO, infrastructure, IT, and travel
    • SCEC science program cut by only $51K (15% of total cut)

• Budget future
  – Unknown, but perhaps larger, cuts must be considered, given the federal budget situation
    • “easy cuts” have already been made; some are not sustainable
  – New sources of funding should be developed
    • 32 of the last 33 SCEC proposals have been fully funded or almost fully funded, including SEISM (NSF), Geoinformatics (NSF), VISES (NSF), UseIT (NSF), and CSEP (USGS, DHS)
Science Results!

• The awesome sweep of research organized through the SCEC Base Program is amply illustrated in the PC’s report
  – Highlighted throughout this meeting

• Excellent progress has been made on the major SCEC4 initiatives in a remarkably short amount of time
  – Two Special Fault Study Areas (SFSAs) have been inaugurated
  – Workshops have been held to develop the new Community Geodetic Model (CGM) and Community Stress Model (CSM)

• Banner year for the SCEC Communication, Education, and Outreach (CEO) program
  – 9.4 million people registered for the 2012 California ShakeOut
  – 7.8 million have already registered for the 2013 California ShakeOut

You should register TODAY!
Two Important TAG Publications


Focus Section on the SCEC Geodetic Transient-Detection Validation Exercise in *Seismol. Res. Lett.*, May/June 2013
SCEC Workshops, Jan-May, 2013

- Community Online Resource for Statistical Seismicity Analysis
  - Conveners: Jeremy Zechar and Jiancang Zhuang, 01/21/13, Tokyo, Japan
- UCERF3.2 Fault-by-Fault Evaluation Meeting
  - Convenor: Ned Field, 01/24/13, Menlo Park
- Workshop on Use of UCERF3 in the National Seismic Hazard Maps
  - Convenor: Ned Field, 02/21/13 Menlo Park
- SCEC Rupture Dynamics Code Validation Workshop
  - Convenor: Ruth Harris, 03/15/13, Menlo Park
- Ground Motion Simulation Validation TAG Workshop
  - Conveners: Nico Luco and Sanaz Razaeian, 04/03/13, Los Angeles
- SCEC Committee for Utilization of Ground Motion Simulations
  - Conveners: C. B. Crouse and Tom Jordan, 04/03/2013 Los Angeles
- Ductile Rheology of the Southern California Lithosphere
  - Conveners: Wayne Thatcher, Yuri Fialko, Elizabeth Hearn, and Greg Hirth, 05/01/2013, Menlo Park
- SCEC CSEP Workshop on Testing External Forecasts and Predictions
  - Convenors: Tom Jordan, Max Werner, Andy Micheal, and Tom Bleier, 05/07/13, Los Angeles
SCEC Workshops, May-Sept, 2013

• Community Stress Model Workshop
  – Convenors: Jeanne Hardebeck, Brad Aagaard, Thorsten Becker, David Sandwell, Bruce Shaw, and John Shaw, 05/29/13, Menlo Park

• Community Geodetic Model Workshop
  – Convenors: Jessica Murray, David Sandwell, and Rowena Lohman, 05/30/13, Menlo Park

• Community Modeling Environment Workshop
  – Convenor: Phil Maechling, 06/02/13, Palm Springs

• The Ventura Special Fault Study Area
  – Convenors: James Dolan, John Shaw, and Thomas Rockwell, 08/15/13, Ventura

• Source Inversion Validation (SIV) Workshop
  – Convenors: Martin Mai, Danijel Schorlemmer, and Morgan Page, 09/08/13, Palm Springs

• Workshop on Broadband Platform and Ground Motion Simulations
  – Convenors: Norm Abrahamson and Christie Goulet, 09/08/13, Palm Springs

• Workshop on Comparison and Validation of Earthquake Simulators
  – Convenor: Terry Tullis, 09/08/13, Palm Springs

• Ground Motion Simulation Validation Workshop
  – Convenors: Nico Luco and Sanaz Rezaeian, 09/08/13, Palm Springs
Uniform California Earthquake Rupture Forecast (UCERF3)

Objectives:

- Relaxation of fault segmentation
- Direct use of geodetic data to constrain deformation rates
- Incorporation of two types of time dependence:
  - Reid renewal
  - Omori-Utsu clustering

- UCERF3.3 (time-independent) has been finalized and submitted to NSHMP.
- Time-dependent components are under active development.
Collaboratory for the Study of Earthquake Predictability

Infrastructure for automated, blind, prospective testing of forecasting models in a variety of tectonic environments and on a global scale

- SCEC Testing Center
  - California 64 models
  - Global 9 models
  - Oceanic Transform Faults 1 model

- EU Testing Center
  - Italy 48 models

- China Testing Center
  - North-South Seismic Belt

- ERI Testing Center
  - Japan 203 models

- GNS Science Testing Center
  - New Zealand 15 models

- Western Pacific 16 models

Canterbury Retrospective Experiment, Nov, 2013
CSEP Structure

Accommodation of External Forecasting

Authoritative Data Source A

Authoritative Data Source B

Data Registry

Forecast Model 1

Forecast Model N

Testing Procedures

Results

Special Data Source

External Forecasting Procedure

Authoritative Eqk Catalog

Forecast Registry
Community Modeling Environment

- Broadband Platform validation project underway
  - Report by SCEC evaluation committee, chaired by Doug Dreger

- New array of CyberShake hazard models
  - New rupture model, multiple codes, CVM-S4 and CVM-H11.9
  - New techniques have been developed to understand and compare the CyberShake results with GMPE-based hazard models

- Tomographic platforms have been developed to improve the Community Velocity Models used in earthquake simulations.
  - New version of the CVM-S developed by Po Chen (U. Wyoming) and his colleagues is being implemented into the Unified California Velocity Model (UCVM) framework for use in CyberShake and other earthquake simulation projects

- High-F Project has deployed the AWP-ODC and Hercules codes on the world’s most powerful supercomputers and extend simulations to 5 Hz and beyond
  - Must account for source complexity, scattering by small-scale, near-surface heterogeneities, frequency-dependent Q
New HPC Resources Used by SCEC CME Collaboration

SCEC 2013 allocations at these sites total 140 million CPU-hrs, 290 TB of storage, and 0.5 FTE.
Results from “Early Science” Systems

UC San Diego Team Achieves Petaflop-Level Earthquake Simulations on GPU-Powered Supercomputers

Accelerated Code Cuts Time and Cost in Seismic Modeling

A team of researchers at the San Diego Supercomputer Center (SDSC) and the Department of Electronic and Computer Engineering at the University of California, San Diego, has developed a highly scalable computer code that promises to dramatically cut both research times and energy costs in simulating seismic hazards throughout California and elsewhere.

The team, led by Yi Ren, a computational scientist at SDSC, developed the scalable GPU (graphical processing units) accelerated code for use in earthquake engineering and disaster management through regional earthquake simulations at the petascale level as part of a larger computational effort coordinated by the Southern California.

Simulated Wave Propagation for the Mw5.4 Chino Hills, CA, Earthquake, Including a Statistical Model of Small-Scale Heterogeneities

$t=10$ sec

For the two simulations shown, all differences can be attributed to the impact of the geological structural model. The simulation on the left shows a Chino Hills simulation with unmodulated SCEC Community Velocity Model (CVM-S v11.2). The simulation on the right shows a Chino Hills simulation that uses a modified version of CVM-S v11.2 that contains more realistic small-scale complexity. The simulations show that the more complex velocity structure used in the left simulation clearly impacts the ground motion distribution, the levels of peak ground motion, and the duration of shaking. The next scientific step is to compare both simulation results against observed data for this event to determine which velocity model most closely reproduces the observed ground motions for this earthquake.
CyberShake Platform: Physics-Based PSHA

KFR = kinematic fault rupture model
AWP = anelastic wave propagation model
NSR = nonlinear site response
Dependence of Directivity Effects on Rupture Complexity

GenSlip v2.1
Graves & Pitarka (2007)

\[ \bar{\sigma}_d = \langle \sigma_d(r,k) \rangle_{K,R} \]

<table>
<thead>
<tr>
<th>Model</th>
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<tr>
<td>v2.1 raw</td>
<td>0.41</td>
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<tr>
<td>v2.1-SC08</td>
<td>0.31</td>
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\( \sigma_d \) maps (SA-3s)
CyberShake – SC08
**Dependence of Directivity Effects on Rupture Complexity**

**GenSlip v3.2**
Graves & Pitarka (2010)

\[
\bar{\sigma}_d = \langle \sigma_d(r,k) \rangle_{K,R}
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<tr>
<td>v3.2 raw</td>
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<td>v3.2-SC08</td>
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</table>

**\( \sigma_d \) maps (SA-3s)**
CyberShake – SC08

- v2.1 raw: 0.41
- v2.1-SC08: 0.31
- v3.2 raw: 0.26
- v3.2-SC08: 0.17
Dependence of Basin Effects on Velocity Structures
(SA corrected for $V_{s30}$)

CVM-S4

CVM-H11.9

T=3.0s

T=5.0s

T=10.0s

Abrahamson & Silva (2008) NGA GMPEs

CS11

Abrahamson & Silva (2008) NGA GMPEs

CS13
SCEC NSF/DOE Allocation Awards
(CPU hours)

140 million CPU hrs in 2013!
Growth and Spread of ShakeOut Drills

2008: 5.4 million
Southern California

2009: 6.9 million
California, New Zealand West Coast

2010: 7.9 million
California, Nevada, Guam

2011: 12.5 million
CA, NV, GU, OR, ID, BC, and Central US
(AL, AR, GA, IN, IL, KY, MI, MO, OK, SC, TN)

2012: 19.4 million
All above plus: AK, AZ, Southeast (DC,
GA, MD, NC, SC, VA), UT, WA, Puerto Rico, Japan (central Tokyo), New Zealand, Southern Italy (US naval bases and surrounding areas), and “Global” site for all other areas

2013: 20+ million?
All above except New Zealand, plus:
Rocky Mountain region (CO, WY, MT), HI,
OH (added to Central U.S. region), WV & DE (added to the Southeast region),
Northeast region (CT, PA, MA, ME, NH,
NJ, NY, PA, RI), American Samoa, U.S.
Virgin Islands, Commonwealth of the Northern Marianas Islands. Charlevoix region of Quebec, and expansion across Japan
Great ShakeOut Earthquake Drills
Now in a State (or Country) near You!

The 2008 “Great Southern California ShakeOut” was planned as a one-time event to motivate millions of people to practice “Drop, Cover, and Hold On” and to get prepared at work, school, and home for the potential of a major earthquake. With the involvement of many partner organizations, the ShakeOut program has since expanded to include 42 states and U.S. territories, plus four other countries. More than 19.5 million people participated in 2012.

ShakeOut Origins
Beginning in 2007, Dr. Lucy Jones of the U.S. Geological Survey (USGS) led more than 300 scientists, engineers, and others to create the “ShakeOut Scenario,” a comprehensive study of how a magnitude 7.8 earthquake on the San Andreas Fault would directly affect southern California (and economically the entire country). This became the basis of a state-led exercise held in November 2008. To involve the general public in the exercise, the Earthquake Country Alliance (ECA) organized a set of activities including the first ShakeOut drill on November 13, 2008. The Southern California Earthquake Center (SCEC), with funding from the National Science Foundation (NSF) and the USGS, developed supercomputer simulations of this earthquake as the basis for loss estimation in the scenario, and to communicate the intensity of expected ground shaking.

ShakeOut website at www.shakeout.org. Courtesy of SCEC.
Undergraduate Studies in Earthquake Information Technology (UseIT)

2013 Grand Challenge: Explore UCERF3.3 and produce visualizations of the earthquake hazard in Southern California for public education during the 20th Anniversary of the 1994 Northridge earthquake
2013 SCEC Annual Meeting - Scientific Response Scenario Activity
Earthquake!
Uh-oh, earthquake coming!

Me!
‘Northridge Near You’ Scenarios

• At this Annual Meeting, we will use six of the ‘Northridge Near You’ scenarios as a set of earthquake response exercises

• Focus on scientific goals of post-event research
  – Obtain synoptic overview of main rupture and significant secondary effects
  – Capture perishable data such as surface faulting, landslide, liquefaction, etc.
  – Observe aftershock patterns and characterize statistics of their occurrence
  – Capture deformation transients
‘Northridge Near You’ Scenarios

- These exercises will contribute to the planning of scientific observations that will be made after future earthquakes in Southern California.
  - How should the scientific community respond?
  - In what ways can advanced (and rapid) planning result in improved scientific data acquisition?
  - What key observations are needed to answer remaining big questions in earthquake science?
  - For each scenario, think it over and interact with the interns and your colleagues in lobby.
1) San Gorgonio: M 6.85, right-lateral strike slip (local thrusting)
34.116, -117.112, depth = 7 km
2) Ventura M 6.55, thrust
34.401, -119.235, depth = 12 km
SCEC Community Post-Earthquake Science Response Exercise

1. What scientific questions can be answered?
   - thru geological observations?
   - thru geodetic observations?
   - thru seismologic observations?
   - thru other geophysical methods (e.g. drilling)?
   - thru theoretical and numerical modeling?

2. What data should be acquired?
   - by instrument deployments?
   - by field observations?
   - by remote sensing?

3. What new observational systems should be developed?
   How can the current systems be improved?

4. What method do you use for sharing data?
   (e.g. response.scec.org, CA Earthquake Clearinghouse, data centers, etc.)

How should we respond to the earthquake scenario above? Review, discuss, and respond in the space provided above. Go to the SCEC UserT Demo to learn more about this “Northridge Near You” scenario.

How should we respond to a “Northridge Near You” scenario?

<table>
<thead>
<tr>
<th>Location</th>
<th>Magnitude</th>
<th>Type</th>
<th>Coordinates</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasadena-Raymond (Downtown LA)</td>
<td>M 6.65</td>
<td>oblique, thrust &amp; left-lateral</td>
<td>34.179, -118.137, depth = 9 km</td>
<td></td>
</tr>
<tr>
<td>Santa Barbara–Red Mountain (Ventura)</td>
<td>M 6.55</td>
<td>thrust</td>
<td>34.461, -119.235, depth = 12 km</td>
<td></td>
</tr>
<tr>
<td>Ontario–Cucamonga (Rialto)</td>
<td>M 6.55</td>
<td>thrust</td>
<td>34.250, -117.517, depth = 7 km</td>
<td></td>
</tr>
<tr>
<td>Santa Ana–Elsinore (Whittier)</td>
<td>M 6.85</td>
<td>oblique, thrust &amp; right-lateral</td>
<td>33.944, -117.811, depth = 7 km</td>
<td></td>
</tr>
<tr>
<td>Mission Valley–Rose Canyon (San Diego)</td>
<td>M 6.75</td>
<td>right-lateral strike slip</td>
<td>32.890, -117.259, depth = 6 km</td>
<td></td>
</tr>
</tbody>
</table>

Write your answers in the space above. Numbers 1–4 refer to the questions from the poster to the left. Go to the SCEC UserT Demo for more information on these earthquake scenarios.
Hilton Palm Springs Plaza Ballroom

Sunday, September 8, 2013
08:00 - 20:00  Poster Set-Up
17:00 - 19:00  Meeting Ice-Breaker (BAR, water station)
21:00 - 22:30  Poster Viewing (Water Station)

Monday, September 9, 2013
16:00 - 17:30  Poster Viewing (Water Station)
21:00 - 22:30  Poster Viewing (Water Station)

Tuesday, September 10, 2013
16:00 - 17:30  Poster Viewing (Water Station)
21:00 - 22:30  Poster Viewing (Water Station)

Wednesday, September 11, 2013
07:00 - 08:00  Poster Removal

Two Posters per Poster Board
Maximum Poster Size:
45 in high x 45 in wide

Anne Rosinski, CGS
Chair, California Earthquake Clearing House
SCEC4 Timeline

- SCEC4 begins
- 2012 Meeting
- 2013 Retreat
- 2013 Meeting
- 2014 Retreat
- 2014 Meeting
- SCEC5 proposal due

NOW
# Agenda

## Monday, September 9

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:00 - 08:00</td>
<td>SCEC Annual Meeting Registration &amp; Check-In at Hilton Lobby</td>
</tr>
<tr>
<td>07:00 - 08:00</td>
<td>Breakfast at Hilton Poolside</td>
</tr>
<tr>
<td>08:00 - 11:00</td>
<td><strong>The State of SCEC</strong>&lt;br&gt;Location: Horizon Ballroom, Hilton Palm Springs</td>
</tr>
<tr>
<td>08:00</td>
<td>Welcome and State of the Center (Tom Jordan)</td>
</tr>
<tr>
<td>08:30</td>
<td>Report from the National Science Foundation (Greg Anderson)</td>
</tr>
<tr>
<td>08:45</td>
<td>Report from the U.S. Geological Survey (Bill Leith)</td>
</tr>
<tr>
<td>09:00</td>
<td>Communication, Education, &amp; Outreach (Mark Benthien)</td>
</tr>
<tr>
<td>09:30</td>
<td>SCEC Science Accomplishments and Collaboration Plan (Greg Beroza)</td>
</tr>
<tr>
<td>11:00 - 11:30</td>
<td>Break</td>
</tr>
<tr>
<td>11:30 - 13:00</td>
<td><strong>Stress Transfer from Plate Motion to Crustal Faults: Long-Term Fault Slip Rates</strong>&lt;br&gt;Location: Horizon Ballroom, Hilton Palm Springs</td>
</tr>
<tr>
<td>13:00 - 14:30</td>
<td>Lunch at Hilton Restaurant, Tapestry Room, and Poolside</td>
</tr>
<tr>
<td>14:30 - 16:00</td>
<td><strong>Stress-Mediated Fault Interactions and Earthquake Clustering: Evaluation of Mechanisms</strong>&lt;br&gt;Location: Horizon Ballroom, Hilton Palm Springs</td>
</tr>
<tr>
<td>16:00 – 17:30</td>
<td>Poster Session 2 in Plaza Ballroom</td>
</tr>
<tr>
<td>19:00 - 21:00</td>
<td><strong>SCEC Honors Banquet</strong> at Hilton Poolside</td>
</tr>
<tr>
<td>21:00 - 22:30</td>
<td>Poster Session 3 in Plaza Ballroom</td>
</tr>
</tbody>
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**Science Session 1** (Monday 11:30)<br>New paleoseismic data from SoSAFE: time dependency and rupture patterns on the San Andreas and San Jacinto Faults, Kate Scharer (USGS) – see p.10<br>**Beyond the Time-Independent Uniform California Earthquake Rupture Forecast: Where Should SCEC Go From Here?** Bill Ellsworth (USGS) – see p.11

**Science Session 2** (Monday 14:30)<br>Recent Results from the Collaboratory for the Study of Earthquake Predictability (CSEP), Max Werner (Princeton) – see p.11<br>Variable seismic response to fluid injection in central Oklahoma, Katie Kerenan (Cornell) – see p.12
Tuesday, September 10

07:00 - 08:00  Breakfast at Hilton Poolside

08:00 - 09:30  Evolution of Fault Resistance During Seismic Slip: Scale-Appropriate Laws for Rupture Modeling  
Moderator: Eric Dunham (Stanford)  
Location: Horizon Ballroom, Hilton Palm Springs

09:30 - 11:00  Structure and Evolution of Fault Zones and Systems: Relation to Earthquake Physics  
Moderator: Emily Brodsky (UCSC)  
Location: Horizon Ballroom, Hilton Palm Springs

11:00 - 11:30  Break

11:30 - 13:00  Causes and Effects of Transient Deformations: Slow Slip Events and Tectonic Tremor  
Moderator: Rowena Lohman (Cornell)  
Location: Horizon Ballroom, Hilton Palm Springs

13:00 - 14:30  Lunch at Hilton Restaurant, Tapestry Room, and Poolside

14:30 - 16:00  Seismic Wave Generation and Scattering: Prediction of Strong Ground Motions  
Moderator: Jean-Paul Ampuero (Caltech)  
Location: Horizon Ballroom, Hilton Palm Springs

16:00 - 17:30  Poster Session 4 in Plaza Ballroom

19:00 - 21:00  Dinner at Hilton Poolside

19:00 - 21:00  SCEC Advisory Council Meeting in Boardroom

21:00 - 22:30  Poster Session 5 in Plaza Ballroom
Wednesday, September 11

07:00 - 08:00  Poster Removal from Plaza Ballroom
07:00 - 08:00  Breakfast at Poolside

08:00 - 09:30  Earthquake Early Warning and Risk Communication
Moderator: Lucy Jones (USGS)
Location: Horizon Ballroom, Hilton Palm Springs

09:30 - 11:00  The Future of SCEC
Location: Horizon Ballroom, Hilton Palm Springs

09:30      2014 Science Collaboration Planning (Greg Beroza)
10:30      Report from the SCEC Advisory Council (Jeff Freymueller)
11:00      Adjourn

11:30 - 13:30  SCEC Planning Committee Lunch Meeting in Palm Canyon Room
11:30 - 13:30  SCEC Board of Directors Lunch Meeting in Tapestry Room

Science Session 7 (Wednesday 08:00)
Earthquake early warning: Now, or after the next big quake? Richard Allen (UC Berkeley)
– see p.15
Setting the stage for early earthquake alerts and warnings, Ann Bostrum (U Washington)
– see p.16
Enjoy the meeting!
3) Pasadena - Raymond (Downtown LA); M 6.65, oblique, thrust & left-lateral
34.179, -118.137, depth = 9 km
4) Mission Valley – Rose Canyon (San Diego); M 6.75, right-lateral strike slip
32.898, -117.259, depth = 6 km
5) Ontario – Cucamonga (Rialto); M 6.55, thrust
34.240, -117.517, depth = 7 km
6) Santa Ana – Elsinore (Whittier); M 6.85, oblique, thrust & right-lateral
33.944, -117.811, depth = 7 km