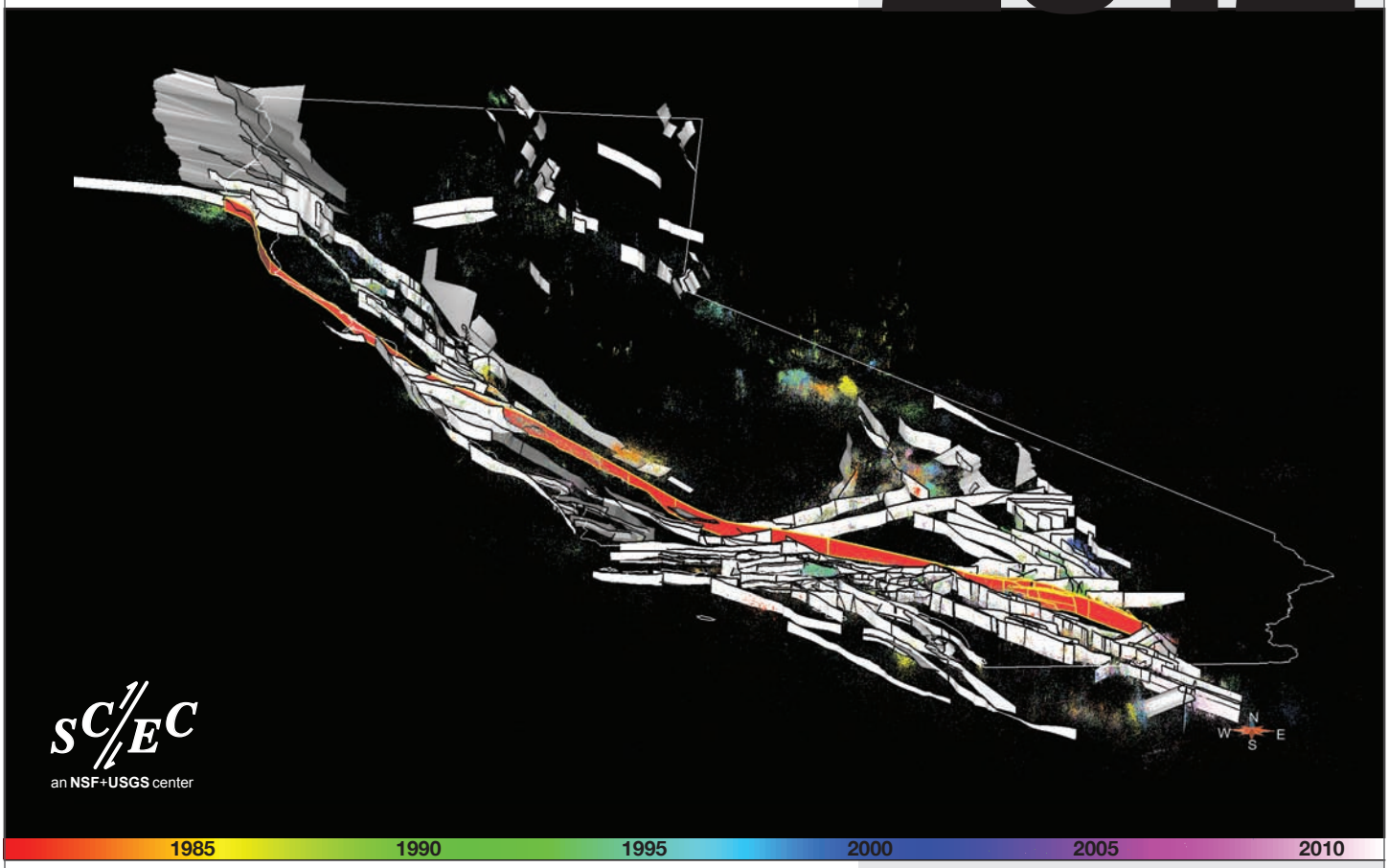
Southern California Earthquake Center

ANNUAL MEETING 2012



MEETING PROGRAM

September 8-12, 2012

Core Institutions and Board of Directors (BoD)

The Board of Directors (BoD) is the primary decision-making body of SCEC; it meets three times annually to approve the annual science plan, management plan, and budget, and deal with major business items. The Center Director acts as Chair of the Board. The liaison members from the U.S. Geological Survey are non-voting members.

USC **Tom Jordan***	Harvard **Jim Rice**	UC Los Angeles **Peter Bird**	UC Santa Cruz **Emily Brodsky**	USGS Pasadena **Rob Graves**
Caltech **Nadia Lapusta****	MIT **Tom Herring**	UC Riverside **David Oglesby**	UNR **Glenn Biasi**	At-Large Member **Roland Bürgmann**
CGS **Chris Wills**	SDSU **Steve Day**	UC San Diego **Yuri Fialko**	USGS Golden **Jill McCarthy**	At-Large Member **Judi Chester**
Columbia **Bruce Shaw**	Stanford **Paul Segall**	UC Santa Barbara **Ralph Archuleta**	USGS Menlo Park **Ruth Harris**	* Chair ** Vice-Chair

Science Working Groups & Planning Committee (PC)

The leaders of the Disciplinary Committees and Interdisciplinary Focus Groups serve on the Planning Committee (PC) for three-year terms. The PC develops the annual Science Collaboration Plan, coordinates activities relevant to SCEC science priorities, and is responsible for generating annual reports for the Center. Leaders of SCEC Special Projects (i.e., projects with funding outside the core science program) also serve on the Planning Committee. They ensure the activities of the Special Projects are built into the annual science plans.

	Disciplinary Com.	Interdisciplinary Focus Groups		Special Projects
PC Chair **Greg Beroza***	Seismology **Egill Hauksson*** **Elizabeth Cochran**	USR **John Shaw*** **Brad Aagaard**	FARM **Judi Chester*** **Pablo Ampuero**	CME **Phil Maechling***
	Tectonic Geodesy **Jessica Murray*** **Dave Sandwell**	SoSAFE **Kate Scharer*** **Ramon Arrowsmith**	SDOT **Kaj Johnson*** **Thorsten Becker**	CSEP **Tom Jordan** **Danijel Schorlemmer***
	EQ Geology **Lisa Grant Ludwig*** **Mike Oskin**	EFP **Jeanne Hardebeck*** **Ilya Zaliapin**	GMP **Kim Olsen*** **Rob Graves**	WGCEP **Ned Field***
	Computational Sci **Yifeng Cui*** **Eric Dunham**	EEII **Jack Baker*** **Jacobo Bielak**		* PC Members

Advisory Council (AC)

The external Advisory Council (AC) provides guidance in all aspects of Center activities, including basic and applied earthquake research and related technical disciplines, formal and informal education, and public outreach. Members of the AC are elected by the Board for three-year terms and may be re-elected. The Council meets annually to review Center programs and plans, and prepares a report for the Center.

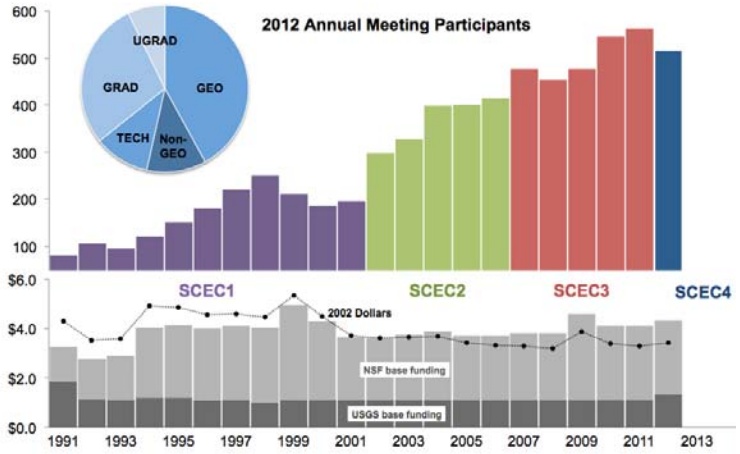
Jeff Freymueller, Chair U Alaska	**Susan Cutter** U South Carolina	**Bob Lillie** U Western Ontario	**Farzad Naeim** John A Martin
Gail Atkinson Western Ontario	**Donna Eberhart-Phillips** UC Davis	**Anne Meltzer** Lehigh	**John Vidale** U Washington
Roger Bilham U Colorado	**Jim Goltz** CalEMA (retired)	**M. Meghan Miller** UNAVCO	**Andrew Whittaker** MCEER/Buffalo

Center Management

	Center Administration	Communication, Education & Outreach	Information Technology
Center Director **Tom Jordan**	Associate Director **John McRaney**	Associate Director **Mark Benthien**	Associate Director **Phil Maechling**
Deputy Director **Greg Beroza**	Special Projects/Events **Tran Huynh**	Education Programs **Bob de Groot**	Research Programmer **Scott Callaghan** **Masha Liukis** **Kevin Milner** **Fabio Silva**
	Contracts & Grants **Karen Young**	Digital Products **John Marquis**	
	Admin Coordinator **Deborah Gormley**		Systems Programmer **John Yu**

Welcome to the 22nd SCEC Annual Meeting!

The week's activities mark the first year of the five-year phase of the Center (SCEC4) that began on February 1 of this year. This meeting will focus on the collaboration plan for the science to be pursued under SCEC4, with a particular emphasis on those elements and initiatives that are new to the collaboration.



Upper bar chart shows registrants at SCEC Annual Meetings 1991-2012. Pie chart shows the demographic profile for 2012 pre-registrants (516 total). The lower bar chart is the history of SCEC base funding in as-spent millions of dollars; the connected dots are the base-funding totals in 2002 dollars.

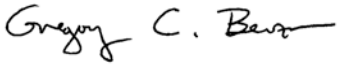
The Planning Committee has put together a compelling program that features keynote speakers on thought-provoking subjects, discussion sessions on major science themes, poster sessions on research results, technical demonstrations, education/outreach activities, and some lively social gatherings. There will be a number of workshops, group meetings, and a fieldshop during the weekend before the main meeting begins.

On Sunday afternoon, David Wald, of the USGS Golden, will get the meeting off to a great start with a plenary presentation "Rupture to Rafters on a Global Scale." Lucy Jones and Tim Sellnow will speak to the topic of effective risk communication Monday morning, and CB Crouse will speak on the utility of ground motion simulations for earthquake building codes on Monday afternoon. Tuesday morning, Pablo Ampuero will give a talk on new approaches to seismic imaging and characterizing extreme events and Egill Hauksson will give us an update on the recent earthquake swarm near Brawley. That will be followed by a session on computational science in SCEC4 featuring a pair of talks by Jeroen Tromp and Jeremy Kozdon. Late that afternoon we will have a discussion on Special Fault Study Areas, and Wednesday morning there will be a forward-looking presentation by Tom Parsons on scientific questions motivated by UCERF3.

Veterans of past SCEC meetings know that much of the action happens in the poster sessions. In a change from recent years, posters will stay up for the entire meeting. To accomplish this, we had to reduce the size of posters by half. So we've put a premium on being concise in the expectation that keeping the posters up will lead to more and better interactions. We are always looking for ways to improve the meeting, so if you have comments on how to improve this, or other aspects of it, please let someone in the SCEC leadership know.

We hope you enjoy the science, the meals, the good company, and the spectacular tectonic setting of Palm Springs!

Thomas H. Jordan, Director



Gregory C. Beroza, Deputy Director

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Go to meeting website:
www.scec.org/meetings/2012am

Cover Image

Perspective view of the California Community Fault Model (CCFM) and relocated earthquake hypocenters (Waldhauser and Schaff, 2008; Hauksson et al., 2011). The CCFM contains more than 270 fault representations, assembled and evaluated by the SCEC USR scientists and attendees of numerous SCEC and UCERF workshops, *courtesy of Andreas Plesch (Harvard).*

Saturday, September 8

10:00 - 21:00 **Southern San Andreas Fault Evaluation (SoSAFE) Fieldshop I**
Explore mapping techniques, base maps, and quality ranking that affect the measurement of small channel offsets, uncertainties and reproducibility.

Conveners: Kate Scharer (USGS), Ramon Arrowsmith (ASU)
Location: in the field

10:00 Depart Hilton Lobby

12:00 Meet at First Field Site (106 Street E in Pearblossom, CA)

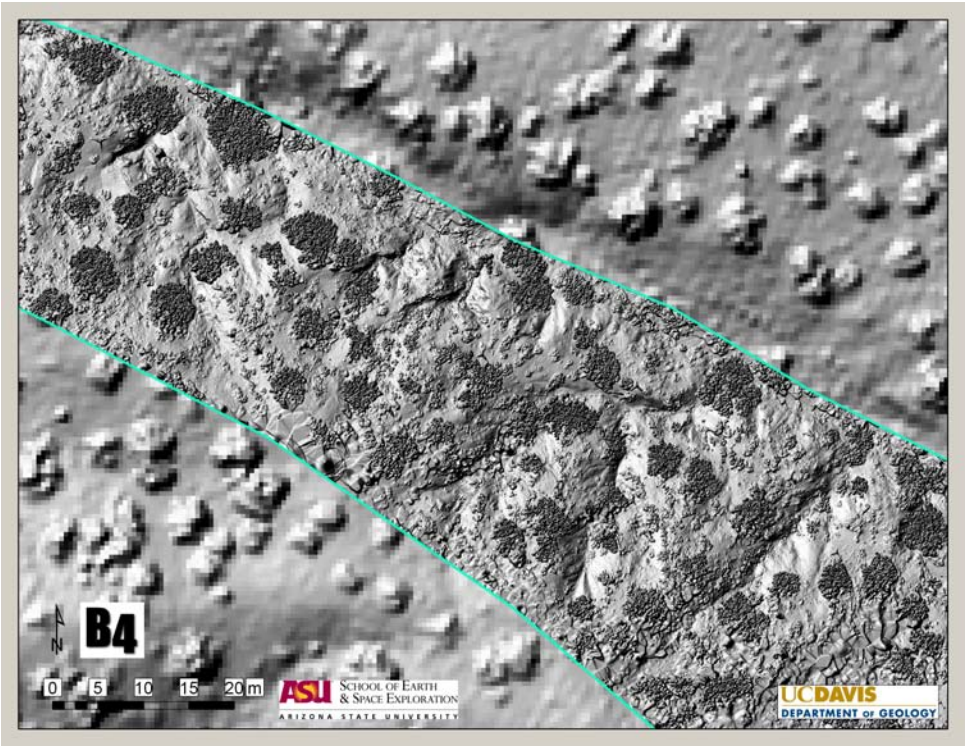
Participants will be split into groups and given base maps and tapes to map and measure offsets near Pearblossom, CA. Each offset will be measured and mapped by multiple groups. In addition to examining reproducibility of measurements, the goal of the field activity is to generate questions and discussion on how offset uncertainties can be recorded, features that limit measurement precision, and recommendations on nomenclature for describing the features and their quality. Participants must turn in completed measurements at the end of the day to be compiled for discussion the following day. Lunch will be provided.

17:00 Depart

18:00 Group Dinner

20:00 Depart Restaurant

21:00 Arrive at Hilton Lobby



Hillshade from 5 cm DEM (terrestrial LiDAR scan courtesy of Peter Gold, Tracy Compton, and Eric Cowgill [UC Davis]) draped over hillshade from 50 cm B4 DEM

14:00 - 17:00 **SCEC Annual Meeting Registration & Check-In** at Hilton Lobby

Sunday, September 9

07:00 - 18:30 **SCEC Annual Meeting Registration & Check-In** at Hilton Lobby

07:00 - 08:00 **Breakfast** at Hilton Poolside

08:00 - 20:00 **Poster Set-Up** in Plaza Ballroom

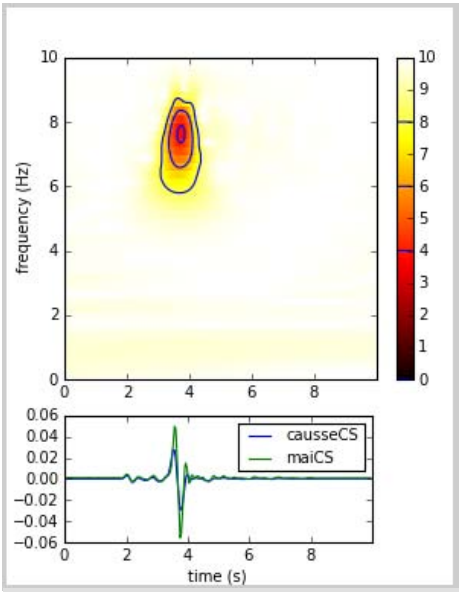
08:00 - 12:00 **Workshop: Source Inversion Validation (SIV)**

Develop strategies for automated source inversion algorithms that require no (or minimal) human interaction and provide testable rupture model output with rigorously quantifiable uncertainties.

Conveners: P. Martin Mai (KAUST), Danijel Schorlemmer (GFZ), and Morgan Page (USGS)

Location: Palm Canyon Room, Hilton Palm Springs

- 08:00 Introduction and overview of workshop goals (Martin Mai)
- 08:10 Current SIV benchmarks and results (Martin Mai)
- 08:30 Recent developments in source inversion using the W-phase (Zacharie Duputel)
- 09:00 Rapid extraction of seismic source properties - strengths and limitations of teleseismic body-wave data (Martin Vallée)
- 09:30 On rapid automated finite-fault inversions, Guangfu Shao (Chen Ji)
- 10:00 Break
- 10:15 Quantifying the quality of kinematic source optimizations through rigorous testing and automatization (Henriette Sudhaus & Danijel Schorlemmer)
- 10:45 Open Discussion
  - Current and future SIV benchmarks
  - Towards an SIV testing center
  - General SIV strategy and funding
- 12:00 Adjourn



Source Inversion Validation benchmark solution showing goodness of fit for the time frequency envelope between two signals in the database. A goodness of fit between 8 and 10 is considered excellent, between 6 and 8 good, between 4 and 6 fair, and below 4 poor.

08:00 - 12:00 **Workshop: Modeling Advances in SCEC Geodesy**

Present findings, progress, and next steps for three closely linked efforts within the SCEC community: development of the Community Geodetic Model (CGM), geodetic transient detection, and geodetic source inversion validation.

Conveners: Rowena Lohman (Cornell), Jessica Murray (USGS)

Location: Horizon Ballroom, Hilton Palm Springs

Community Geodetic Model (CGM)

- 08:00 Introduction/Overview of motivation and goals/target audiences (Jessica Murray)
- 08:10 CGM as input for the Uniform California Earthquake Rupture Forecast (UCERF) and Community Stress Model (CSM) (Kaj Johnson & Jessica Murray)
- 08:30 Geodetic Coverage: GPS and InSAR (Jessica Murray & Scott Baker)
- 08:50 Approaches available for integrating GPS and InSAR

  Quantifying uncertainties - what precision is needed and possible? (Roland Bürgmann)
- 09:15 General Discussion
- 09:30 Break

continued on next page …

Sunday, September 9

08:00 - 12:00 **Workshop: Modeling Advances in SCEC Geodesy** (*continued*)

Geodetic Transient Detection

10:00 Introduction/Summary of effort so far (Rowena Lohman)

10:10 Presentations by groups on results from their approaches, (William Holt, Tom Herring/Kang Ji)

10:30 Presentation on "operational" portion of effort (Masha Liukis)

10:40 General Discussion

10:50 Break

Geodetic Source Inversion Validation

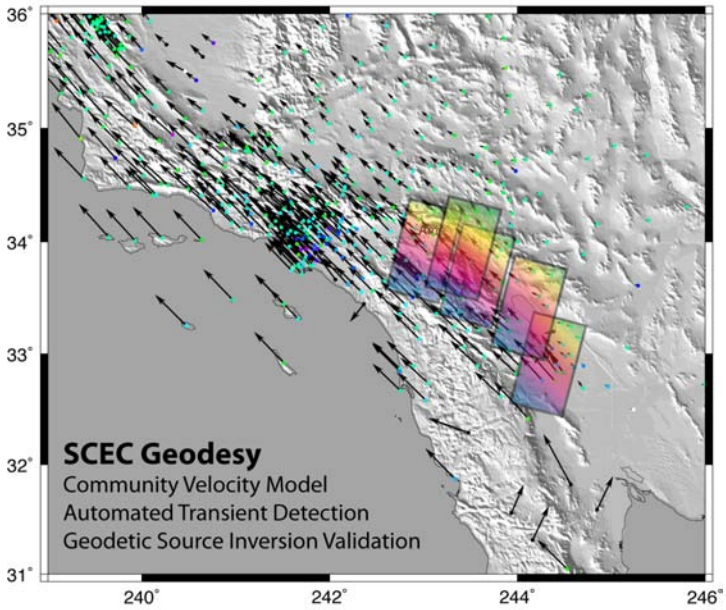
11:10 Introduction and motivation (Rowena Lohman)

11:20 New approaches (Brendan Meade)

11:30 Unveiling of initial data sets and framework for comparisons (Rowena Lohman)

11:40 General Discussion

12:00 Adjourn



08:00 - 12:00 **Community Modeling Environment (CME) Group Meeting**
Convener: Phil Maechling (USC)
Location: Tapestry Room, Hilton Palm Springs

09:00 - 16:00 **NEES@UCSB Workshop and Site Visit: Using Earthquake Field Data in Research and Education**
Conveners: Jamie Steidl (UCSB), Sandy Seale (UCSB)
Location: Start at Cahuilla Room, Spa Resort Casino

09:00 Introduction to the Garner Valley Downhole Array (GVDA)

11:00 Travel to and Tour of GVDA Field Site

14:00 Depart GVDA

15:00 Follow-Up Session and Q&A at Spa Resort Hotel

16:00 Adjourn

Garner Valley Downhole Array:
nees.ucsb.edu/facilities/gvda

12:00 - 13:00 **Lunch** at Hilton Palm Springs Restaurant and Poolside

Sunday, September 9

13:00 - 17:00 **Workshop: Ground Motion Simulation Validation Progress**

Develop near-term plans for validation of ground motion simulation models on (or soon to be on) the SCEC Broadband Platform, for use in developing the median part of ground motion prediction equations for elastic spectral acceleration.

Convener: Nico Luco (USGS)
Location: Horizon Ballroom, Hilton Palm Springs

13:00 Welcome and Background of GMSV Technical Activity Group and Broadband Platform Validation Project (Tom Jordan)

13:05 Overview of Agenda (Nico Luco)

SCEC Broadband Platform Validation Project
Moderator: Phil Maechling

13:10 Session Introduction (Phil Maechling)

13:15 Motivation and Needs (Norm Abrahamson)

13:30 Validation Plans (Christine Goulet)

13:45 Simulation Plans (Paul Somerville)

14:00 Discussion

14:30 Break

SCEC GMSV Technical Activity Group Projects
Moderator: Nico Luco

14:45 Session Introduction (Nico Luco)

14:50 Engineering Perspective on Simulation Validation and Use of the Broadband Platform (Jack Baker, Lynne Burks)

15:05 Validation of Broadband Platform Ground Motion Simulations for Historical Events (Farzin Zareian, Sanaz Rezaeian)

15:20 Comparison of CyberShake Hazard Models with NGA Models Using Averaging-Based Factorization (Feng Wang, Tom Jordan)

15:35 Discussion

15:50 Break

Priority GMSV Activities for 2013 SCEC Science Collaboration Plan
Moderator: Kim Olsen

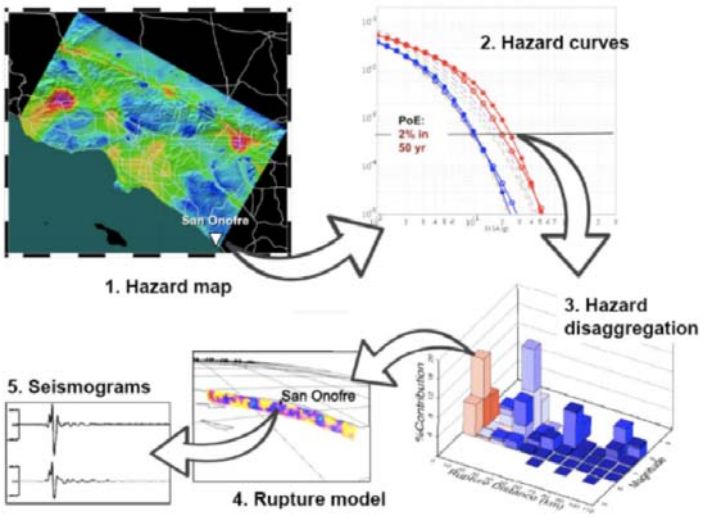
16:05 Session Introduction (Kim Olsen)

16:10 Summary and Background of 2012 Priorities (Nico Luco)

16:20 Discussion

16:50 Summary of Discussions (Kim Olsen, Nico Luco)

17:00 Adjourn



The prototype CyberShake hazard model (CSHM-1, showing layer of hazard information. (1) Hazard map for the Los Angeles region. (2) Hazard curves computed for a site near San Onofre Nuclear Generating Station. (3) Disaggregation of hazard in terms of rupture magnitude and distance. (4) Rupture model of the earthquake with the highest hazard to the site. (5) Seismograms simulated for the earthquake with the highest hazard to site. Arrows show how users can query the model starting at highest levels (e.g. hazard map) to access information at progressively lower levels (e.g. seismograms).

Sunday, September 9

13:00 - 17:00 **Southern San Andreas Fault Evaluation (SoSAFE) Fieldshop II**
Explore mapping techniques, base maps, and quality ranking that affect the measurement of small channel offsets, uncertainties and reproducibility.

Conveners: Kate Scharer (USGS), Ramon Arrowsmith (ASU)
Location: in the field

13:00 Introduction / Overview (Kate Scharer, Ramon Arrowsmith)

Review obtained measurements and draft a ranking system and nomenclature for geomorphic offsets. A few short presentations of geomorphic offset studies will be given so that participants can discuss the results and interpretations in light of the field activity. Computer-based approaches for measuring offsets will be discussed and available for comparison.

- Offset channel measurement validation (Barrett Salisbury)
- Terrestrial Laser Scanner data acquisition and processing: example from Little Rock along the San Andreas Fault (Tracy Compton)
- Cumulative offset probability distributions (Ramon Arrowsmith)
- Additional short presentations and discussions

17:00 Adjourn

17:00 - 18:00 **Annual Meeting Ice-Breaker** in Hilton Lobby and Plaza Ballroom

18:00 - 19:00 **Distinguished Speaker Presentation** in Horizon Ballroom

19:00 - 20:30 **Welcome Dinner** at Hilton Poolside

19:00 - 20:30 **SCEC Advisory Council Meeting** in Tapestry Room

20:30 - 22:00 **Poster Session 1** in Plaza Ballroom

Distinguished Speaker Presentation (Sunday 18:00)

Rupture to Rafters on a Global Scale, David Wald (USGS) – *see p.10*

Monday, September 10

07:00 - 08:00 **SCEC Annual Meeting Registration & Check-In** at Hilton Lobby

07:00 - 08:00 **Breakfast** at Hilton Poolside

08:00 - 10:30 **The State of SCEC**
Location: Horizon Ballroom, Hilton Palm Springs

08:00 Welcome and State of the Center (Tom Jordan)
08:30 Report from the National Science Foundation (Greg Anderson)
08:45 Report from the U.S. Geological Survey (Bill Leith)
09:00 Communication, Education, & Outreach (Mark Benthien)
09:30 SCEC Science Accomplishments (Greg Beroza)

10:30 - 11:00 Break

11:00 - 13:00 **Risky Business - Risk Perception and Risk Communication**
Moderators: Lisa Grant-Ludwig (UCR), Mark Benthien (USC)
Location: Horizon Ballroom, Hilton Palm Springs

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

14:30 - 16:00 **Poster Session 2** in Plaza Ballroom

16:00 - 18:00 **The Importance of Faking It - Ground Motion Simulation for Earthquake Engineering**
Moderators: Rob Graves (USGS), Brad Aagaard (USGS)
Location: Horizon Ballroom, Hilton Palm Springs

19:00 - 21:00 **SCEC Honors Banquet** at Hilton Poolside

21:00 - 22:30 **Poster Session 3** in Plaza Ballroom

Science Session 1 (Monday 11:00)

Communicating Earthquake Risk: The Intersection of Earth and Social Sciences, Lucy Jones (USGS) and Tim Sellnow (Kentucky) – *see p.10*

Science Session 2 (Monday 16:00)

The Role SCEC Can Play in Improving Seismic Provisions in US Codes through Ground-Motion Simulations, *C.B. Crouse (URS Corp)* – *see p.10*

Tuesday, September 11

07:00 - 08:00 **Breakfast** at Hilton Poolside

08:00 - 10:00 **Out There - New Approaches to Modeling Extreme Events**
Moderators: P. Martin Mai (KAUST), Jessica Murray (USGS)
Location: Horizon Ballroom, Hilton Palm Springs

10:00 - 10:30 Break

10:30 - 12:30 **The Third Pillar - The Value of Computational Science as a Disciplinary Group in SCEC4**
Moderators: Yifeng Cui (SDSC), Eric Dunham (Stanford)
Location: Horizon Ballroom, Hilton Palm Springs

12:30 - 14:00 **Lunch** at Hilton Restaurant, Tapestry Room, and Poolside

12:30 - 14:00 **SCEC Advisory Council Executive Session** in Boardroom

14:00 - 15:30 **Poster Session 4** in Plaza Ballroom

15:30 - 17:30 **Super-Natural Laboratories - Special Fault Study Areas**
Moderators: Kate Scharer (USGS), Mike Oskin (UC Davis)
Location: Horizon Ballroom, Hilton Palm Springs

19:00 - 21:00 **Dinner** at Hilton Poolside

20:00 - 22:00 **SCEC Advisory Council Executive Session** in Boardroom

21:00 - 22:30 **Poster Session 5** in Plaza Ballroom

Wednesday, September 12

07:00 - 08:00 **Poster Removal** from Plaza Ballroom

07:00 - 08:00 **Breakfast** at Poolside

08:00 - 10:00 **The Endless Frontier - Issues Arising from the UCERF3 Project**
Moderators: Morgan Page (USGS), Kaj Johnson (Indiana)
Location: Horizon Ballroom, Hilton Palm Springs

10:30 - 12:00 **The Future of SCEC**
Location: Horizon Ballroom, Hilton Palm Springs

- 10:30 2013 Science Collaboration and RFP (Greg Beroza)
- 11:00 Report from the SCEC Advisory Council (Jeff Freymueller)
- 11:30 Concluding Remarks (Tom Jordan)
- 12:00 Adjourn

12:00 - 14:00 **SCEC Planning Committee Lunch Meeting** in Palm Canyon Room

12:00 - 14:00 **SCEC Board of Directors Lunch Meeting** in Tapestry Room

Science Session 3 (Tuesday 08:00)

Imaging and modeling the unexpected rupture path of an extreme event: the 2012 Mw 8.6 off-Sumatra earthquake, *Jean-Paul Ampuero (Caltech) – p.11*

August 2012 Brawley Earthquake Swarm in Imperial Valley, *Egill Hauksson (Caltech) – p.11*

Science Session 4 (Tuesday 10:30)

Potential of High-Performance Computing for Solid-Earth Science, *Jeroen Tromp (Princeton) – see p.11*

Understanding earthquake source physics through computation, *Jeremy Kozdon (Stanford) – see p.12*

Science Session 5 (Tuesday 15:30)

The Ventura Region Special Fault Study Area: Towards an Understanding of the Potential for Large, Multi-Segment Thrust Ruptures in the Transverse Ranges, *James Dolan (USC) – see p.12*

SCEC Workshop on San Gorgonio Pass: Structure, Stress, Slip, and the Likelihood of Through-Going Rupture, *Doug Yule (CSUN) – see p.13*

Science Session 6 (Wednesday 08:00)

What can crustal deformation tell us about California's earthquake future? Lessons from UCERF3, *Tom Parsons (USGS) – see p.14*

Plenary Talk Presentation — Sunday

Rupture to Rafters on a Global Scale, *David J. Wald (USGS)*

Sunday, September 9, 2012 (18:00)

The U.S. Geological Survey's Prompt Assessment of Global Earthquakes for Response (PAGER) system provides rapid and automated alerting of estimated economic and human impacts following earthquakes around the globe. Although PAGER's primary purpose is to quantify any earthquake's severity for situational awareness and response decision-making, the underlying tools developed are utilized for many other scientific and mitigation efforts. PAGER is an end-to-end system of scientific and engineering results combined for the purpose of loss estimation, analogous to SCEC's notion of "rupture to rafters" computations. There are four components of the PAGER system. First, earthquakes trigger rapid source characterization; second, these source parameters inform our estimates of shaking-distribution (e.g., ShakeMap). Third, losses are then modeled by computed populations exposed per shaking intensity level, and country-specific and shaking-dependent loss functions are used to provide estimates of economic impact and potential casualties. Finally, these uncertain loss estimates are communicated in an appropriate form for actionable decision-making among a variety of users. Rapidly and automatically assessing the wide range of seismological, demographic, building inventory, and vulnerability information necessary to make such loss estimates entails a requisite balance of empirical & physics-based modeling strategies. Several aspects of our problem cannot yet be adequately solved with purely empirical, nor solely mechanistic, approaches. The "physics-based" model components of the PAGER system are essential for informing empirical models where they are data-limited, and for providing a framework for better understanding the causative pathways that dominate earthquake losses around the globe. In the course of explaining the end-to-end strategies and science/engineering employed by the PAGER system, we also describe what pragmatic choices were made in balancing the uncertainties in and benefits provided by our empirical, semi-empirical, expert-opinion, and physical models. We then relate these trade-offs to similar challenges faced by SCEC scientists. Recognizing and reconciling the complimentary benefits of data-driven verses theoretical problem-solving is at the core of the PAGER system, as it is for a wide variety of other challenges within the earth sciences.

Plenary Talk Presentations — Monday

Communicating Earthquake Risk: The Intersection of Earth and Social Sciences, *Lucy M. Jones (USGS) & Timothy L. Sellnow (U Kentucky)*

Monday, September 10, 2012 (11:00)

Earth scientists and engineers face significant challenges in communicating earthquake risk to decision makers, members of the media, and the public. Some earth scientists have empirically developed an understanding of the opportunities and challenges in expressing the risk posed by earthquakes to non-specialists. Independently, researchers in psychology and communications have completed extensive research on the variability of the public's response to a range of risk communication strategies. This session will compare the empirical experience of scientists in communicating the risk with the results of research in psychology in risk communication. We will focus on three major topics: 1) the challenges of communicating probabilities, 2) the fallacy of the teachable moment – what the public can perceive at times of fear, and 3) lessons from ShakeOut – what the success of ShakeOut tells us about motivating people to take action to protect themselves. For each topic, we will examine the experience of seismologists, compare with social science research that bears on these issues, and seek participation form the audience. The goal is to arrive at practical approaches for earth scientists and engineers to facilitate productive interaction with decision makers, media, and the public.

The Role SCEC Can Play in Improving Seismic Provisions in US Codes through Ground-Motion Simulations, *C.B. Crouse (URS Corp)*

Monday, September 10, 2012 (16:00)

Through its Uniform California Earthquake Rupture Forecast (UCERF) project, SCEC has collaborated with the USGS to establish seismic source models for California. These models will be used to prepare ground-motion maps for possible inclusion in the next edition of the ASCE 7 standard, which will be incorporated by reference in the International Building Code. Probabilistic

and deterministic seismic hazard analysis (PSHA and DSHA) methods will use these models and empirical ground-motion prediction equations (GMPEs), derived from accelerogram data recorded worldwide, to develop the maps. However, these GMPEs are limited in their ability to model long period ground motions in 3-D basin structures, such as those in the greater Los Angeles region. As an alternative to using empirical GMPEs, SCEC's CyberShake project used numerical simulations to generate the ground motions used in a PSHA for Los Angeles; one result was a contour map of 5% damped response spectral acceleration at 3-sec natural period and 2475-year return period. Expanding this effort to include a range of natural periods in the 1 to 10-sec band and forming a subcommittee, consisting of SCEC/USGS seismologists performing the simulations and engineers involved in seismic code development, is recommended to determine whether and how to incorporate the results into regional ground-motion maps for inclusion in the ASCE 7 standard. If the method is judged feasible during this pilot study, then it would be formally introduced in the code-development process and applied to other urban areas where the 3-D velocity structures are well known. If the resulting maps are approved by the code seismic committees, SCEC should store the simulated accelerograms in a data bank that could be easily accessed by structural engineers for dynamic response analysis of long period structures. Depending on the structure, a stochastic component may need to be added to the accelerograms to extend their useful period band to shorter periods < 1 sec, in order to cover higher mode responses.

Plenary Talk Presentations — Tuesday

Imaging and modeling the unexpected rupture path of an extreme event: the 2012 Mw 8.6 off-Sumatra earthquake, *Jean-Paul Ampuero (Caltech)*

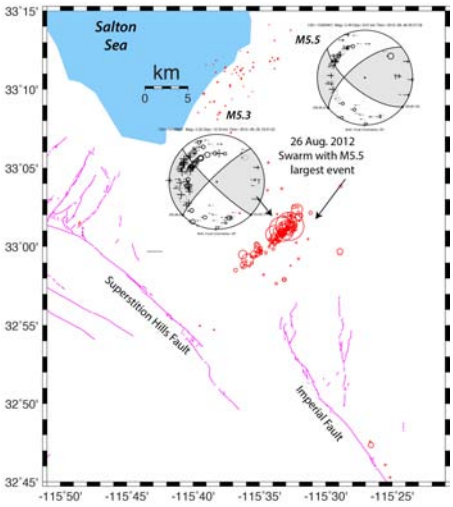
Tuesday, September 11, 2012 (08:00a)

On April 11th 2012 a Mw 8.6 earthquake, the largest strike-slip event known to date, occurred in a diffuse deformation zone in the Indian Ocean, off-shore Sumatra. I will summarize what has been learned so far about this rare event and which puzzles remain unsoved, while highlighting those aspects that are relevant to research in SCEC4, especially on Fault and Rupture Mechanics. Due to its remote location, this earthquake is a good example of the unique information about earthquake rupture processes that can be obtained by high-resolution back-projection source imaging based on teleseismic array data. This technique reveals a complicated rupture path, involving multiple segments of a network of conjugate, almost-orthogonal faults and unexpected features like branching despite compressional dynamic stresses. I will discuss implications of these observations for a range of topics, including earthquake source imaging, dynamic rupture branching, rupture linkage across stepovers, rheology of the deep lithosphere and the maximal depth extent of earthquake rupture, the possibility of rupture through nominally stable fault regions, the timely characterization of rupture growth.

August 2012 Brawley Earthquake Swarm in Imperial Valley, *Egill Hauksson (Caltech)*

Tuesday, September 11, 2012 (08:00b)

The 2012 Imperial Valley Brawley swarm started near the City of Brawley on 22nd of August with six events of M<2.0. The seismic activity picked up early on 23rd of August with increasing rate early in the day. The three largest earthquakes (M5.5, M5.3, and M4.9) in the sequence occurred over a time period of 90 minutes, starting at 12:33 pm on August 23rd. The high rate of seismic activity lasted about 24 hours. This sequence that so far consists of more than 600 events forms a 12 km long linear northeast trending distribution, mostly in the depth range of 8 to 12 km. The focal mechanisms predominantly exhibit strike-slip motion on northeast or northwest striking planes. This swarm occurred in the immediate vicinity of the largest (M5.8) aftershock of the 1979 Mw6.4 Imperial Valley earthquake. Similar seismic swarms have occurred in the Brawley seismic zone in the past, especially in the 1970s and 1980s but in the 1990s the region was seismically quiet. The Brawley seismic zone is the northern most spreading center of the Gulf of California rift zone, which transfers slip from the Imperial fault in the south to the San Andreas fault in the north.



Map of CISN/SCSN relocations with 3D and HypoDD: Brawley Swarm, August 2012, *from the SCSN website (www.scsn.org/2012Brawley.html).*

Potential of High-Performance Computing for Solid-Earth Science, *Jeroen Tromp (Princeton)*

Tuesday, September 10, 2012 (10:30a)

In recent years, modeling, simulation and computation have come to play a central role in modern solid-Earth science in general, and seismology in particular. With dramatic increases in the quality and quantity of geophysical data and the availability of sophisticated open-source numerical modeling tools, there is a need for a more organized, community-driven approach to computational solid-Earth science. As an example, the California Seismic Network, the EarthScope USArray

Transportable Array, the permanent Backbone Array, and the Flexible Array are providing seismologists with a wealth of new data. Data analysis is keeping up with data acquisition only for the computationally simplest analysis methods, as even computationally modest analysis is often still labor intensive. Modeling of and imaging with this data requires powerful numerical modeling tools, automation of routine analysis tasks, and dedicated high-performance computing facilities.

Most simulations are currently performed on modest in-house facilities, or through grants at various national supercomputing centers. A dedicated simulation facility would accommodate the substantial computational demands of modern solid-Earth science, including, for example, kinematic and dynamic rupture simulations to assess seismic hazard, data assimilation simulations in geodynamics, seismology, and geomagnetism, and full waveform inversions in global and regional seismology. Such a facility would not obviate the need for local resources, instead the local facilities would be used for development, scenario testing, and education, acting as the on-ramp to the earth science HPC facility. The facility would benefit investigators at universities that have limited HPC resources by providing hardware, software engineering, training and a community specific environment to draw on. The goal of such a computational solid-Earth science center should be to provide our community a system structured specifically for our simulation/imaging needs, which include large fast storage capacity, large memory, and a large number of cores, configured in a system designed for long run-times, which also allows for user interaction between iterations in compute intensive inversions.

Understanding earthquake source physics through computation, *Jeremy E. Kozdon (Stanford)*

Tuesday, September 11, 2012 (10:30b)

What are the physical mechanisms for incoherent, high-frequency ground motion? How does complex geometry affect the rupture process? At what scales must we model events to have reliable and physically realistic simulations? What processes give rise to self-similarity in earthquakes? How does the stress evolve over multiple earthquake cycles? In this talk, I will present highlights of how our group is using dynamic rupture models and high-performance computing to explore these questions. Though our focus will be on dynamic rupture models, the lessons we have learned can aid the SCEC community at large in thinking about computations.

We initially explored incoherence of high-frequency ground motion through fault roughness. As a rupture encounters local stress heterogeneities it accelerates and decelerates which, along with fluctuations in slip, excites incoherent ground motion. Recently, we have begun considering the importance of path effects in a heterogeneous medium. Scattering both generates in incoherent ground motion and feeds back into the rupture process leading to further incoherence. Untangling the relative importance of these mechanisms requires dynamic rupture simulations.

Computation can help answer other geometry and material structure related questions. Using dynamic rupture models of the Tohoku earthquake, we are exploring how ruptures can reach the seafloor through a shallow velocity strengthening fault segment and what hydroacoustic signals might tell us about shallow slip. Though subduction zone events may not be directly related to the primary SCEC objectives, rupture dynamics in other geometrically complex fault systems featuring spatially variable frictional properties are. For instance, which branch will a rupture take in a fault network? Can an earthquake in this system jump to another fault? How do local fault geometry and frictional properties affect segmentation?

Rupture processes are multiscale and using laboratory measured parameters requires millimeter resolution. Even with exascale resources, this is impossible for regional simulations with fixed grids. One way forward is adaptive mesh refinement (AMR). In AMR, resolution is added as and where required, significantly reducing the computational overhead. Currently, we are using AMR to explore self-similarity and possible physical mechanisms (in particular, off-fault plasticity and/or thermal pressurization) underlying observed earthquake energy balance and scaling laws.

The Ventura Region Special Fault Study Area: Towards an Understanding of the Potential for Large, Multi-Segment Thrust Ruptures in the Transverse Ranges, *James F. Dolan (USC), John H. Shaw (Harvard), & Thomas K. Rockwell (SDSU)*

Tuesday, September 11, 2012 (15:30a)

The recent occurrence of several highly destructive thrust fault earthquakes (e.g., 1994 Mw 6.7 Northridge; 1999 Mw 7.6 Chi-Chi; 2005 Mw 7.5 Kashmir; 2008 Mw 7.9 Wenchuan; 2011 Mw 7.2 Van) and the growing recognition of the hazards posed by such structures to urban centers around the world highlight the need to better understand the behavior of these faults and their associated folds. The 2008 Wenchuan earthquake, in particular, emphasized that ruptures may link together various thrust faults to generate extremely large-magnitude earthquakes. The growing realization of the possibility of multi-fault ruptures, coupled with the presence of numerous large reverse faults within the Transverse Ranges, emphasizes the necessity of assessing the hazards posed by such

multi-segment thrust earthquakes in southern California. The major reverse faults of the Transverse Ranges form an interconnected, >200-km-long network that could potentially rupture together during very large-magnitude events similar to the Wenchuan earthquake. Of particular importance is the complex network of faults in the Ventura area. These faults could potentially serve as linking structures connecting large thrust ramps to the west (e.g., Pitas Point fault) with the large thrust and reverse faults to the east (e.g., San Cayetano, Santa Susana, and Sierra Madre-Cucamonga faults, the latter extending all the way across the northern edge of the Los Angeles metropolitan region.

The critical need to understand the faults of the Ventura region has led SCEC to designate this as a Special fault Study Area (SFSA). The goal of this SFSA is to focus multi-disciplinary efforts of many SCEC researchers on the common problem of understanding the structure, state of activity, slip rates, and seismic hazards of the Ventura region faults, and more generally on assessing the degree to which these faults provide potential structural linkages for through-going, large-magnitude multi-segment ruptures. Much of this research is already under way with SCEC funding, including 3D structural modeling using industry well and seismic reflection data and newly collected high-resolution reflection data, both onshore and offshore paleoseismologic work aimed at determining the slip rates of these faults and the ages and displacements of ancient earthquakes that they have generated, studies of tsunami records preserved in estuarine sediments, mechanical modeling of regional fault interactions, and dynamic rupture simulations. In addition to describing preliminary results from these studies at the SCEC Annual Meeting, we will also discuss the format of a planned SCEC workshop on this SFSA to be held in 2013.

SCEC Workshop on San Gorgonio Pass: Structure, Stress, Slip, and the Likelihood of Through-Going Rupture*, Doug Yule (CSUN), Michele L. Cooke (UMass), & David Oglesby (UCR)*

Tuesday, September 11, 2012 (15:30b)

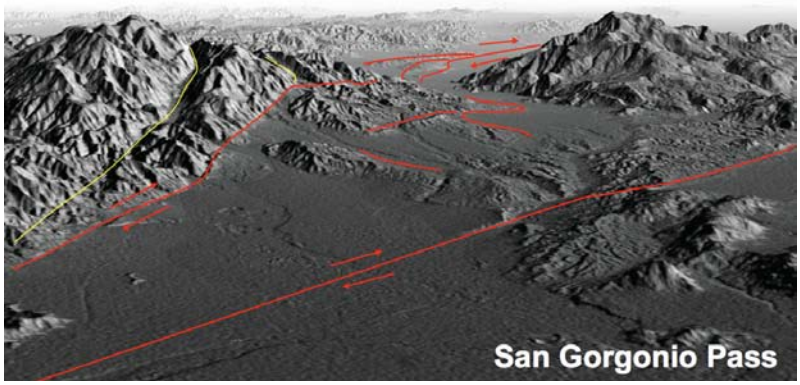


Image courtesy of Mike Oskin (UC Davis)

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Plenary Talk Presentation — Wednesday

What can crustal deformation tell us about California's earthquake future? Lessons from UCERF3, *Tom Parsons (USGS)*

Wednesday, September 12, 2012 (08:00)

We want to characterize seismogenic deformation in California to make earthquake probability calculations. UCERF assumes that earthquake rates are proportional to deformation rates; in particular, the rates that faults slip. Extensive use of GPS observations is a new feature brought into UCERF3. Geodetic measurements tend to be more areally comprehensive than geologic offset observations. However, all measures are subject to considerable uncertainty that include dating errors and modeling assumptions. The ~150-yr earthquake catalog is shown to identify sites of future activity in California, but it is temporally limited and may be incomplete for infrequent high magnitude events.

How best to balance these deformation measures into a form that can be translated into future earthquakes? I describe our efforts to test, compare, contrast, and apply five candidate deformation models that use geodetic and/or geologic measurements to calculate fault slip rate and residual "off-fault" seismogenic deformation: (1) a group of block models, (2) an FEM, (3) a buried dislocation model, (4) a geologic model, and (5) the UCERF2 deformation model. We find that all fit the vast majority of observed data well, and at first glance are viable representations of California deformation within data constraints.

However, every model had problems that required iterations and revisions. This is caused in part by the UCERF3 earthquake rate approach that breaks faults into ~5-10 km long subsections, meaning more section rates must be found than before. Even if a given model fits 95% of subsections to data - an acceptable standard for a scientific publication - it only takes a few anomalous results to cause important changes to hazard.

Traditional PSHA methods of working from identified earthquake sources may underreport hazard when applied to an area as large as California, where it is unlikely that every fault has been discovered. By contrast, geodetic techniques may overreport hazard because they record virtually all surface strain whether it is seismogenic or not. Indeed geodetic deformation models imply increased moment release (14%-25%) compared with the UCERF2 model and the earthquake catalog.

The UCERF3 process offers hope that complimentary data are applicable to hazard assessment. However, there remains an information gap that necessitates consensus judgments on how best to balance some conflicting results from different temporal and spatial deformation measures.

Poster Session Schedule

View full abstracts at www.scec.org/meetings/2012am

Sunday, September 9, 2012

20:00 – 22:00 Poster Session 1

Monday, September 10, 2012

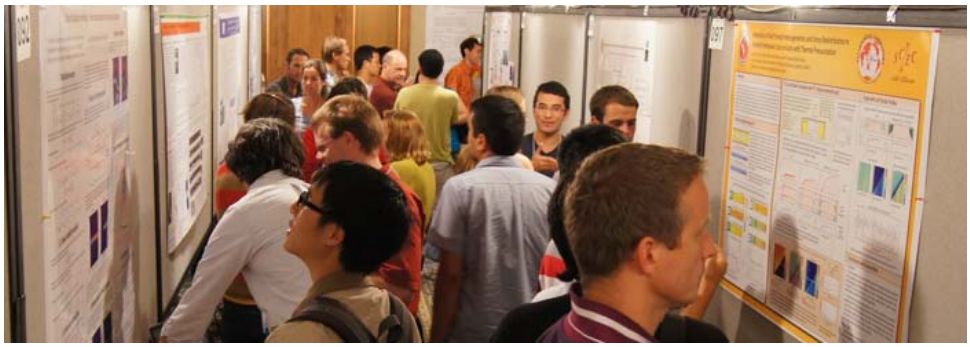
14:30 – 16:00 Poster Session 2

21:00 – 23:00 Poster Session 3

Tuesday, September 11, 2012

14:00 – 15:30 Poster Session 4

21:00 – 23:00 Poster Session 5



Ground Motion Prediction (GMP)

Posters 001-027

001 **Maximum peak ground velocity in Los Angeles Basin**, *Norman H. Sleep*

002 **Importance of 1-point statistics in earthquake source modeling for ground motion simulation**, *Seok Goo Song and Luis A. Dalguer*

003 **Ground Motion Prediction Equations for data recorded within and around the San Jacinto Fault Zone**, *Ittai Kurzon, Frank L. Vernon, Yehuda Ben-Zion, and Gail Atkinson*

004 **Using the SCEC Broadband Platform for Supplementing Empirical Data on Fling Effects**, *Ronnie Kamai, Kathryn Wooddell, and Norman Abrahamson*

005 **Fragile Geologic Features and Points in Hazardspace in New Zealand**, *Mark W. Stirling and Dylan H. Rood*

006 **Strong ground motions of the Mw 6.3 2009 L'Aquila earthquake: modeling and validation**, *Frantisek Gallovic, Gabriele Ameri, and Francesca Pacor*

007 **Analysis of Terrain Proxy Using Measured Vs30 Data**, *Alan Yong*

008 **Kinematic earthquake rupture scenarios for the Salt Lake segment, Wasatch fault**, *Morgan P. Moschetti, Stephen Angster, Leonardo Ramirez-Guzman, Stephen Hartzell, Stephen Personius, and William Stephenson*

009 **Using Averaging-Based Factorization to Compare Seismic Hazard Models Derived from 3D Earthquake Simulations with NGA Ground Motion Prediction Equations**, *Feng Wang and Thomas H. Jordan*

010 **Nonlinear amplification factors at SC strong motion stations**, *Dominic Assimaki, Jian Shi, and Alan Yong*

011 **Testing seismic hazard models with Be-10 exposure ages for precariously balanced rocks**, *Dylan H. Rood, Rasool Anooshehpoor, Greg Balco, Glenn Biasi, James Brune, Richard Brune, Lisa Grant-Ludwig, Katherine Kendrick, Matthew Purvance, and Inyo Saleeby*

012 **Estimation of path effects on the ground motion standard deviation based on the empirical data and the simulated waveforms from the CyberShake platform** *Manuela Villani and Norman Abrahamson*

013 **Development of excess pore water pressure in liquefiable soils inferred from vertical array records**, *Daniel Roten, Donat Fäh, and Fabian Bonilla*

014 **On the Prediction of Earthquake Ground Motion**, *Daniel Lavallee, Jan Schmedes, and Ralph J. Archuleta*

015 **Simulation of the 1994 Northridge Earthquake Including Nonlinear Soil Behavior**, *Doriam Restrepo, Ricardo Taborda, and Jacobo Bielak*

016 **Improved Green's Functions Using Physical Constraints**, *Marine AM. Denolle and Gregory C. Beroza*

017 **3-D Rocking Response of Precariously Balanced Rocks** *Swetha Veeraraghavan and Swaminathan Krishnan*

018 **A Recursive Division Stochastic Strike-Slip Seismic Source Algorithm Using Insights from Laboratory Earthquakes and Implications of a Big One in the Los Angeles Basin**, *Hemanth Siriki and Swaminathan Krishnan*

019 **Deterministic High-Frequency Ground Motions from Simulations of Dynamic Rupture along Rough Faults**, *Kyle B. Withers, Kim B. Olsen, Zheqiang Shi, Rumi Takedatsu, and Steve Day*

020 **New Earthquake Classification Scheme for Mainshocks and Aftershocks in the NGA – West2 Ground Motion Prediction Equations (GMPEs)**, *Kathryn E. Wooddell and Norman A. Abrahamson*

021 **Understanding the NGA-West ground-motion prediction equations for PGA and PGV SSA Abstract 2012** *Annemarie S. Baltay, Gregory C. Beroza, and Thomas C. Hanks*

022 **Broadband Ground Motion Simulations Using Hybrid of Low Frequency deterministic and High Frequency Source- and Site-Specific Empirical Greens Function Approach**, *Ramses Mourhatch and Swaminathan Krishnan*

023 **Ground Motions from Large-Scale Dynamic Rupture Simulations**, *Zheqiang Shi and Steven M. Day*

024 **Using the SCEC Broadband Platform for Strong Ground Motion Simulation and Validation**, *Fabio Silva, Philip J. Maechling, Kim Olsen, Ralph Archuleta, Robert Graves, Christine Goulet, Paul Somerville, Thomas H. Jordan, and Broadband Platform Working Group*

025 **Geomorphic Erosional Models for Estimating Ages of Precariously Balanced Rocks from Cosmogenic Isotope Data**, *Richard J. Brune, Lisa Grant-Ludwig, Katherine Kendrick, and James N. Brune*

026 **Testing CyberShake Using Precariously Balanced Rocks**, *Jessica R. Donovan, Thomas H. Jordan, and James N. Brune*

027 **Source and Basin Structure Studies using the 8 August 2012 Yorba Linda Earthquake Sequence**, *Shengji Wei, Robert W. Graves, Dunzhu Li, and Don Helmberger*

Earthquake Engineering Implementation Interface (EEII) — Posters 028-032

028 **Response of a tall building far from the epicenter of the March 11, 2011 M=9.0 Tohoku, Japan earthquake and aftershocks**, *Mehmet Celebi, Izuru Okawa, Toshidate Kashima, Shin Koyama, and Masanori Iiba*

029 **Engineering validation of hybrid broadband ground motion simulations**, *Lynne S. Burks and Jack W. Baker*

030 **Engineering Validation of Ground Motion Simulation: Part 1. Tall Buildings**, *Carmine Galasso, Peng Zhong, and Farzin Zareian*

031 **Engineering Validation of Ground Motion Simulation: Part 2. Skewed Bridges**, *Farzin Zareian, Carmine Galasso, and Peyman Kaviani*

032 **Spatial Correlations in Building Response Using Simulated and Recorded Earthquake Scenarios**, *David J. DeBock, Jack W. Garrison, and Abbie B. Liel*

Community Modeling Environment (CME) — Posters 033-039

033 **The influence of complex fault geometry on uplift patterns in the Coachella Valley and Mecca Hills of Southern California**, *Laura Fattaruso and Michele Cooke*

034 **Assessment of site conditions and empirical site response at stations recording near-field extreme ground motions during the 2008 Mogul, Nevada earthquake swarm**, *Aasha Pancha, Satish Pullammanappallil, Glenn Biasi, John N. Louie, and Craig dePolo*

035 **A 77-Fold Speedup and 100 Tflops Acceleration of Seismic Wave Propagation AWP-ODC on Heterogeneous Supercomputers**, *Efecan Poyraz, Jun Zhou, Dong Ju Choi, Amit Chourasia, and Yifeng Cui*

036 **Full-3D Waveform Tomography for Southern California**, *En-Jui Lee, Po Chen, Thomas Jordan, Philip Maechling, Marine Denolle, and Gregory Beroza*

037 **Optimizing the CyberShake Platform for Probabilistic Seismic Hazard Analysis**, *Scott Callaghan, Philip Maechling, Gideon Juve, Gaurang Mehta, Karan Vahi, Mats Rynge, Robert Graves, Kim Olsen, and Thomas H. Jordan*

038 **Spatial Variability of Shallow Velocity Measurements in the Los Angeles Area**, *William H. Savran, Kim B. Olsen, and Bo H. Jacobsen*

039 **Investigating absolute stress in southern California: How well do stress models of compensated topography and fault loading match earthquake focal mechanisms?**, *Karen M. Luttrell, Bridget R. Smith-Konter, and David T. Sandwell*

Earthquake Early Warning (EEW) — Posters 040-042

040 **Improved Ground-Motion Predictions for Earthquake Early Warning During Large Earthquakes**, *Maren Boese, Tom Heaton, Egill Hauksson, Robert Graves, Scott Callaghan, and Philip Maechling*

041 **The ARIA project: Advanced Rapid Imaging and Analysis for Natural Hazard Monitoring and Response.**, *Susan E. Owen, Frank Webb, Mark Simons, Paul Rosen, Jennifer Cruz, Sang-Ho Yun, Eric Fielding, Angelyn Moore, Hook Hua, Piyush Agram, and Paul Lundgren*

042 **Rapid Source Characterization of the 2011 Tohoku-oki Earthquake with Real-Time GPS and Strong Motion Data**, *Brendan W. Crowell, Diego Melgar, and Yehuda Bock*

Collaboratory for the Study of Earthquake Predictability (CSEP) — Posters 043-047

043 **Betting against the house and peer-to-peer gambling: a Monte Carlo view of earthquake forecasting**, *Jeremy D. Zechar and Jiancang Zhuang*

044 **Study on the Earthquake Potential Risk in Western United States by LURR Method Based on Seismic Catalogue, Fault Geometry and Focal Mechanisms**, *Yongxian Zhang, M. Burak Yikilmaz, and John B. Rundle*

045 **Comparison of earthquake forecasting tests in Kanto district and all over Japan**, *Sayoko Yokoi, Hiroshi Tsuruoka, Kazuyoshi Nanjo, and Naoshi Hirata*

046 **Very Short-Term (Sub-24h) and Event-Based Earthquake Forecasting Experiments in California**, *Maximilian J. Werner, Agnes Helmstetter, David D. Jackson, and Yan Y. Kagan*

047 **Collaboratory for the Study of Earthquake Predictability: Recent Developments and Extensions**, *Maria Liukis, Danijel Schorlemmer, John Yu, Philip J. Maechling, Jeremy D. Zechar, Maximilian J. Werner, Thomas H. Jordan, and the CSEP Working Group*

Working Group on California Earthquake Probabilities (WGCEP) — Posters 048-051

048 **Initial Results from the UCERF3 Long-term Earthquake Rupture Forecast**, *Morgan T. Page, Edward H. Field, and Kevin Milner*

050 **Using Risk Targeted Ground Motions to Evaluate Seismic Hazard Models**, *Peter M. Powers*

051 **A Fault-based Crustal Deformation Model for UCERF3 and Its Implication to Seismic Hazard Analysis**, *Yuehua Zeng and Zhengkang Shen*

Earthquake Forecasting and Predictability (EFP) — Posters 052-063

052 **Characteristic Earthquake Model, 1884 – 2011, R.I.P.**, *Yan Y. Kagan, David D. Jackson, and Robert J. Geller*

053 **Different types of seismicity clusters in southern California: A case study of non-universal behavior**, *Ilya Zaliapin and Yehuda Ben-Zion*

054 **Information gains of a hybrid earthquake forecasting model**, *David A. Rhoades*

055 **An Analysis of Tradeoffs in Element Size and Approximation Schemes for Earthquake Simulation**, *Eric M. Heien, Michael K. Sachs, Galen Danziger, John B. Rundle, and Louise H. Kellogg*

056 **Modeling seismicity rate changes in Oklahoma and Arkansas**, *Andrea L. Llenos and Andrew J. Michael*

057 **1/f and the Earthquake Problem: Scaling constraints to facilitate operational earthquake forecasting**, *Mark R. Yoder, John B. Rundle, and Donald L. Turcotte*

058 **Using Static Coulomb Models with Rate- and State-Friction Models to Estimate Seismicity Rates for the Canterbury, New Zealand, Earthquake Sequence**, *Charles A. Williams, Sandy Steacy, Matthew Gerstenberger, and David Rhoades*

059 **Using Socioeconomic Data to Calibrate Loss Estimates**, *James R. Holliday and John B. Rundle*

060 **Quantifying the seismic risk with Gutenberg-Richter relation**, *Yi-Hsuan Wu, Chien-Chih Chen, Donald L. Turcotte, and John B. Rundle*

061 **Revising Canterbury, New Zealand seismic design levels to account for time-varying hazard from the continuing Canterbury earthquake sequence.**, *Matthew C. Gerstenberger and The NZ NSHM Team*

062 **Aftershock Probabilities on Southern California Faults from a Million-Year RSQSim Catalog**, *Kevin R. Milner, Thomas H. Jordan, Keith B. Richards-Dinger, and James H. Dieterich*

063 **The Role of Deep Creep in the Timing of Large Earthquakes**, *Charles G. Sammis and Stewart W. Smith*

Fault Rupture and Mechanics (FARM) — Posters 064-106

064 **Are b-values a good indicator of stress?: A view based on laboratory stick-slip experiments**, *Thorsten W. Becker, Thomas Goebel, Danijel Schorlemmer, and Georg Dresen*

065 **Subsurface Rock Damage Structure of the M7.1 Darfield and M6.3 Christchurch Earthquake Sequence Viewed with Fault-Zone Trapped Waves**, *Yong-Gang Li, Gregory De Pascale, and Darren Gravely*

066 **Reversed-polarity secondary deformation structures near fault stepovers**, *Yehuda Ben-Zion, Thomas Rockwell, Zheqiang Shi, and Shiqing Xu*

067 **Non-equilibrium thermodynamics in sheared hard-sphere materials**, *Charles K. Lieou, Ahmed E. Elbanna, James S. Langer, and Jean M. Carlson*

068 **Coseismic slip gradient and rupture jump on parallel fault systems**, *Zaifeng Liu and Benchun Duan*

069 **Laboratory Earthquakes: Measuring surface displacements with high-speed digital image correlation**, *Vito Rubino, Ares J. Rosakis, and Nadia Lapusta*

070 **Shear Localization and the Evolution of Fault Strength**, *Jiangzhi Chen and Alan W. Rempel*

071 **Systematic reduction of pore pressure response near the San Jacinto fault**, *Andrew J. Barbour*

072 **Key results from JFAST: location and structure of the plate boundary in the area of maximum slip during the 2011 Tohoku-Oki earthquake**, *James D. Kirkpatrick and Expedition 343 Scientists*

073 **Observation of far-field Mach waves generated by the 2001 Kokoxili supershear earthquake**, *Martin Vallée and Eric M. Dunham*

074 **Numerical and theoretical analyses of in-plane dynamic rupture on a frictional interface and off-fault yielding patterns at different scales**, *Shiqing Xu and Yehuda Ben-Zion*

075 **Temperature dependence of frictional stability of gabbro and granite**, *Erica K. Mitchell, Kevin M. Brown, and Yuri Fialko*

076 **An earthquake in a maze: compressional rupture branching during the 11 April 2012 M8.6 off-Sumatra earthquake**, *Lingsen Meng*

077 **Ground Shaking and Seismic Source Spectra for Large Earthquakes Around the Megathrust Fault Offshore of Northeastern Honshu, Japan**, *Lingling Ye, Thorne Lay, and Hiroo Kanamori*

078 **Analysis of the Shallow Slip Deficit Using Sub-Pixel Image Correlation:Implications for Fault Slip Rates, and Seismic Hazards**, *James Hollingsworth, James Dolan, Chris Milliner, Sebastien Leprince, Francois Ayoub, and Jean-Philippe Avouac*

079 **Using a multi-cycle earthquake simulator to specify heterogeneous initial conditions for modeling rupture dynamics.**, *Jacquelyn J. Gilchrist, James H. Dieterich, Keith B. Richards-Dinger, and David D. Oglesby*

080 **Factors controlling shallow co-seismic deformation: Quantifying distributed co-seismic deformation of the 1992 Landers earthquake.**, *Chris W. Milliner, James Hollingsworth, James Dolan, Sebastien Leprince, and Francois Ayoub*

081 **Modeling slow slip events, non-volcanic tremor and large earthquakes in the Guerrero subduction zone (Mexico) with space-variable frictional weakening and creep**, *Dimitri Zigone, Yehuda Ben-Zion, and Michel Campillo*

082 **Inferring the Initial Stress State of Large Earthquakes: Fault Branching and Incomplete Slip Partitioning in the 2008 M8 Wenchuan Earthquake Suggest Rotations of the Stress Field**, *Benchun Duan*

083 **Regional extent of the large coseismic slip zone of the 2011 Mw 9.0 Tohoku-Oki Earthquake delineated by on-fault aftershocks**, *Aitaro Kato, Toshihiro Igarashi, and Jun'ichi Fukuda*

084 **Dynamics of anti-plane shear ruptures with off-fault plasticity**, *Ahmed E. Elbanna and Ralph Archuleta*

085 **An old question revisited: the mechanics of shallow creep events on strike slip faults**, *Meng Wei, Yajing Liu, and Jeff McGuire*

086 **Earthquake rupture dynamics in complex geometries using coupled summation-by-parts high-order finite difference methods and node-centered finite volume methods**, *Ossian J. O'Reilly, Eric M. Dunham, Jeremy E. Kozdon, and Jan Nordström*

087 **Rupture Dynamics and Ground Motion from Earthquakes in Heterogeneous Media**, *Samuel A. Bydlon, Jeremy E. Kozdon, and Eric M. Dunham*

088 **"Melt Welt" Mechanism of Extreme Weakening of Gabbro at Seismic Slip Rates**, *Kevin M. Brown and Yuri Fialko*

089 **Dynamic rupture at low mean shear stress initiated with rate/state friction and sustained by thermal pressurization**, *Stuart V. Schmitt, Andrew M. Bradley, Eric M. Dunham, and Paul Segall*

090 **Self-healing slip pulses driven by thermal decomposition: Towards identifying dynamic weakening mechanisms in seismic observations**, *John D. Platt, Robert C. Viesca, and Dmitry Garagash*

091 **Modeling Crack-like/Pulse-like Ruptures on Dip-Slip Faults using Rate-State Friction with a Normal-Stress-Dependent State**, *Kenny J. Ryan and David D. Oglesby*

092 **The Role of Fluid Pressure on Frictional Behavior at the Base of the Seismogenic Zone**, *Greg Hirth and Nick Beeler*

093 **Reconstructing Initial Stress Condition for the 1987 Superstition Hills Earthquake**, *Qiming Liu and Ralph J. Archuleta*

094 **Dynamics of migrating earthquake swarms at Yellowstone and Mount Rainier: Evidence for fluid triggering?**, *David R. Shelly, Seth C. Moran, David P. Hill, Frédérick Massin, Jamie Farrell, and Robert B. Smith*

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MEETING NOTES

The Southern California Earthquake Center (SCEC) is an institutionally based organization that recognizes both **core institutions**, which make a major, sustained commitment to SCEC objectives, and a larger number of **participating institutions**, which are self-nominated through the involvement of individual scientists or groups in SCEC activities and confirmed by the Board of Directors. Membership continues to evolve because SCEC is an open consortium, available to any individual or institution seeking to collaborate on earthquake science in Southern California.

Core Institutions and Representatives

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

Core institutions are designated academic and government research organizations with major research programs in earthquake science. Each core institution is expected to contribute a significant level of effort (both in personnel and activities) to SCEC programs, as wells as a yearly minimum of $35K of institutional resources (spent in-house on SCEC activities) as matching funds to Center activities. Each core institution appoints an ***Institutional Director*** to the Board of Directors.

SCEC membership is open to participating institutions upon application. Eligible institutions may include any organization (including profit, non-profit, domestic, or foreign) involved in a Center-related research, education, or outreach activity. An invitation was sent this summer to all SCEC3 domestic participating institutions and institutions new to SCEC that were funded in 2012 to apply for participating institution status in SCEC4, as called for in the SCEC by-laws. As of August 2012, the following institutions have applied for participating institution status for SCEC4 (2012-2017).

Domestic Participating Institutions and Representatives

Appalachian State Scott Marshall	**Colorado Sch. Mines** Edwin Nissen	**Smith** John Loveless	**U Illinois** Karin Dahmen	**U Wisconsin Madison** Clifford Thurber
Arizona State J Ramon Arrowsmith	**Cornell** Rowena Lohman	**SUNY at Stony Brook** William Holt	**U Kentucky** Sean Bemis	**URS Corporation** Paul Somerville
Brown Terry Tullis	**Georgia Tech** Zhigang Peng	**Texas A&M** Judith Chester	**U Massachusetts** Michele Cooke	**Utah State** Susanne Janecke
CalPoly Pomona Jascha Polet	**Indiana** Kaj Johnson	**U Alaska Fairbanks** Carl Tape	**U Michigan Ann Arbor** Eric Hetland	**Utah Valley** Nathan Toke
CSU Fullerton David Bowman	**JPL** Andrea Donnellan	**UC Berkeley** Roland Bürgmann	**U New Hampshire** Margaret Boettcher	**WHOI** Jeff McGuire
CSU Long Beach Nate Onderdonk	**Oregon State** Andrew Meigs	**UC Davis** Michael Oskin	**U Oregon** Ray Weldon	
CSU San Bernardino Sally McGill	**Penn State** Eric Kirby	**UC Irvine** Lisa Grant Ludwig	**U Texas El Paso** Bridget Smith-Konter	
Carnegie Mellon Jacobo Bielak	**Purdue** Andrew Freed	**U Cincinnati** Lewis Owen	**U Texas Austin** Whitney Behr	

Participating institutions do not necessarily receive direct support from the Center. Each participating institution (through an appropriate official) appoints a qualified ***Institutional Representative*** to facilitate communication with the Center. The interests of the participating institutions are represented on the Board of Directors by two Directors At-Large.

International Participating Institutions

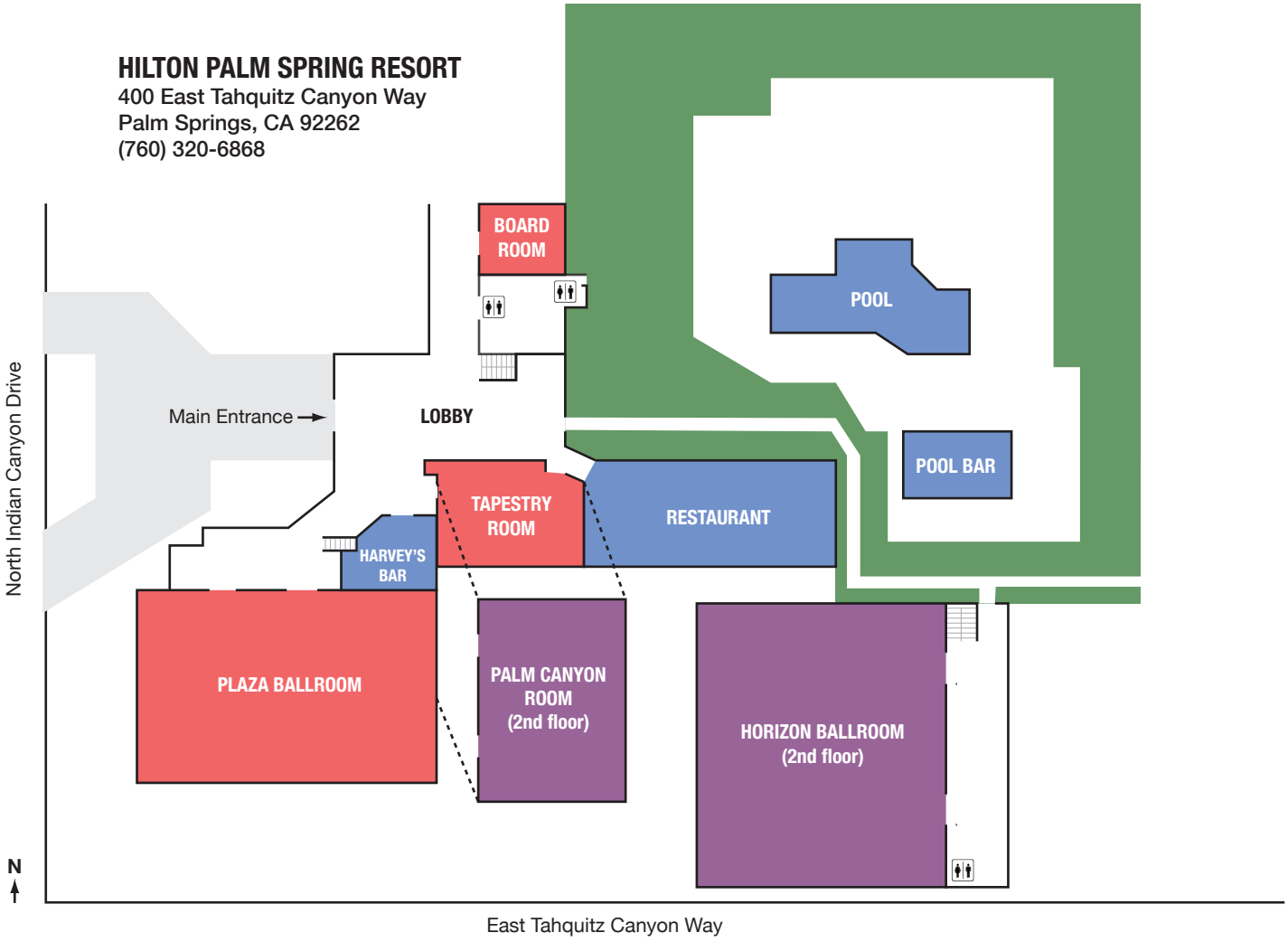
Academia Sinica (Taiwan)	**ERI Tokyo (Japan)**	**Nat'l Central U (Taiwan)**	**U Western Ontario (Canada)**
CICESE (Mexico)	**ETH Zürich (Switzerland)**	**Nat'l Chung Cheng (Taiwan)**	
DPRI Kyoto (Japan)	**IGNS (New Zealand)**	**Nat'l Taiwan U (Taiwan)**	

Apply as a Participating Institution

E-mail application to John McRaney [mcraney@usc.edu]. The application should come from an appropriate official (e.g. department chair or division head) and include a list of interested faculty and a short statement on earthquake science research at your institution. Applications will be approved by a majority vote of the SCEC Board of Directors.

HILTON PALM SPRING RESORT

400 East Tahquitz Canyon Way
Palm Springs, CA 92262
(760) 320-6868



SATURDAY, September 8

10:00-21:00 SoSAFE Fieldshop (depart from Lobby)
14:00-17:00 Registration and Check-In (Lobby)

SUNDAY, September 9

07:00-18:30 Registration and Check-In (Lobby)
07:00-08:00 Breakfast (Poolside)
08:00-20:00 Poster Set-Up (Plaza)
08:00-12:00 Source Inversion Validation (Palm Canyon)
Modeling Advances in SCEC Geodesy (Horizon)
Community Modeling Environment Group Meeting (Tapestry)
09:00-16:00 NEES@UCSB Workshop and Site Visit (Spa Resort Hotel**)
12:00-13:00 Lunch (Restaurant and Poolside)
13:00-17:00 SoSAFE Fieldshop (Palm Canyon)
Ground Motion Simulation Validation Progress (Horizon)
17:00-18:00 Annual Meeting Ice-Breaker (Lobby, Harvey's, Plaza)
18:00-19:00 Distinguished Speaker Presentation (Horizon)
19:00-20:30 Welcome Dinner (Poolside)
19:00-20:30 SCEC Advisory Council Dinner Meeting (Tapestry)
20:30-22:00 Poster Session (Plaza)

MONDAY, September 10

07:00-08:00 Registration and Check-In (Lobby)
07:00-08:00 Breakfast (Poolside)
08:00-10:30 General Session (Horizon)
11:00-13:00 General Session (Horizon)
13:00-14:30 Lunch (Restaurant, Tapestry, Poolside)

MONDAY, September 10 (*continued*)

13:00-14:30 Lunch (Restaurant, Tapestry, Poolside)
14:30-16:00 Poster Session (Plaza)
16:00-18:00 General Session (Horizon)
19:00-21:00 SCEC Honors Banquet (Poolside)
21:00-22:30 Poster Session (Plaza)

TUESDAY, September 11

07:00-08:00 Breakfast (Poolside)
08:00-10:00 General Session (Horizon)
10:30-12:30 General Session (Horizon)
12:30-14:00 Lunch (Restaurant, Tapestry, Poolside)
12:30-14:00 SCEC AC Executive Session (Boardroom)
14:00-15:30 Poster Session (Plaza)
15:30-17:30 General Session (Horizon)
19:00-21:00 Dinner (Poolside)
20:00-22:00 SCEC AC Executive Session (Boardroom)
21:00-22:30 Poster Session (Plaza)

WEDNESDAY, September 12

07:00-08:00 Poster Removal (Plaza)
07:00-08:00 Breakfast (Poolside)
08:00-10:00 General Session (Horizon)
10:30-12:00 General Session (Horizon)
12:00 Adjourn 2012 SCEC Annual Meeting
12:00-14:00 SCEC PC Lunch Meeting (Palm Canyon)
SCEC Board Lunch Meeting (Tapestry)

*** Meet at Cahuilla Room, Spa Resort Hotel across North Indian Canyon Drive from Hilton Palm Springs Resort*