Southern California Earthquake Center

ANNUAL MEETING 2017

SCEC

AN NSF+USGS CENTER

MEETING PROGRAM

September 9-13, 2017

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**, Chair	Harvard **John Shaw**, VC	Texas A&M **Patrick Fulton**	UC Santa Barbara **Toshiro Tanimoto**	USGS Menlo Park **R. Harris, S. Hickman**
Caltech **Jean Phillippe Avouac**	MIT **Tom Herring**	UC Los Angeles **Peter Bird**	UC Santa Cruz **Emily Brodsky**	USGS Pasadena **Rob Graves**
CGS **Tim Dawson**	SDSU **Tom Rockwell**	UC Riverside **David Oglesby**	UNR **Graham Kent**	At-Large Member **TBD**
Columbia **Bruce Shaw**	Stanford **Paul Segall**	UC San Diego **Yuri Fialko**	USGS Golden **Nico Luco**	At-Large Member **TBD**

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 Committee			
	Seismology	Tectonic Geodesy	EQ Geology	Computational Sci
PC Chair **Greg Beroza***	**Yehuda Ben-Zion*** **Jamie Steidl**	**Dave Sandwell*** **Gareth Funning**	**Mike Oskin*** **Whitney Behr**	**Eric Dunham*** **Ricardo Taborda**
	Interdisciplinary Focus Groups / Working Groups			
PC Vice-Chair **Judi Chester***	FARM **Nadia Lapusta*** **Nick Beeler**	SDOT **Kaj Johnson*** **Bridget Smith-Konter**	EFP **Max Werner*** **Ned Field**	Ground Motions **Domniki Asimaki*** **Annemarie Baltay**
* PC Members	EEII **Jack Baker*** **Jon Stewart**	SAFS **Kate Scharer*** **Michele Cooke**	CXM **Liz Hearn*** **Scott Marshall**	Special Projects **Christine Goulet*** **Phil Maechling***

CEO Planning Committee (CEO PC)

The Communication, Education, and Outreach Planning Committee (CEO PC) comprises of stakeholders representing CEO program focus areas (public education and preparedness; K-14 education initiative; experiential learning and career advancement; and the implementation interface). The CEO PC provides guidance for CEO programs, reviews reports and evaluations, and identifies synergies with other parts of SCEC and external organizations.

* Board liaison	**Tim Sellnow***, Chair U Central Florida	**Kate Long** CalOES	**Danielle Sumy** IRIS
		Salley McGill CSUSB	**Tim Dawson*** CGS

Center Management

	Outgoing Center Director **Tom Jordan**	Incoming Center Director **John Vidale**	Center Co-Director **Greg Beroza**	
CEO Assoc Director **Mark Benthien**	CME / IT Assoc Director **Phil Maechling**	Special Projects Exec Sci Director **Christine Goulet**	Science Ops Assoc Director **Tran Huynh**	Administration Assoc Director **John McRaney**
Communications Manager **Jason Ballmann**	Research Programmer **Scott Callaghan** **Fabio Silva**	Research Programmer **Kevin Milner**	Business Ops Specialist **Deborah Gormley**	Contracts & Grants Manager **Karen Young**
Web Manager **John Marquis**	Director of Comp Services **John Yu**		Research Programmer **Edric Pauk**	
ELCA Manager **Gaby Noriega**				
Asst Director of Strat Partners **Sharon Sandow**				

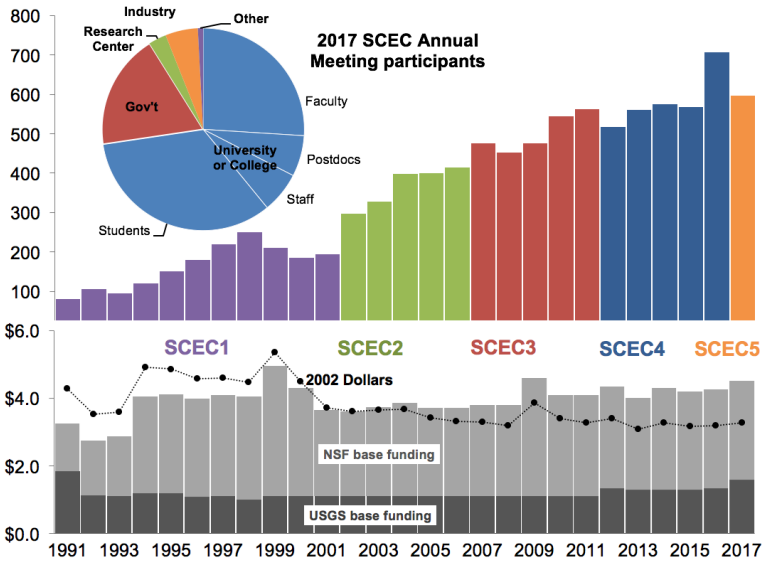
Advisory Council (AC)

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.

Meghan Miller, Chair UNAVCO	**Roger Bilham** UC Boulder	**Warner Marzocchi** INGV Rome	**Tim Sellnow** U Central Florida
Rick Aster Colorado State	**Donna Eberhart-Phillips** UC Davis	**Tom O'Rourke** Cornell Univ	**Heidi Tremayne** EERI
Susan Beck Univ of Arizona	**Yann Klinger** IPGP/Paris	**Susan Owen** NASA JPL	

Welcome to the 2017 SCEC Annual Meeting!

The year 2017 is pivotal for SCEC. It marks the beginning of the fifth phase of the Center (SCEC5: 2017-2022) and the year we transition to a new SCEC Director. During the 2017 SCEC Annual Meeting we will pay tribute to Tom Jordan, who has been the visionary leader of SCEC since 2002. And we welcome John Vidale as the new SCEC Director.



Upper bar chart shows registrants at SCEC Annual Meetings 1991-2017. Pie chart shows the demographic profile for 2017 pre-registrants (596 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 SCEC Science Planning Committee has configured a program that will keep you engaged during your stay in the desert. We will review the advances of SCEC and strategize on the goals set forth in the SCEC5 proposal. Six workshops will be held on Saturday and Sunday, and at 6pm Sunday evening, Lucy Jones will kick off the meeting as our Distinguished Speaker with a talk on "Science in Society: Bridging the Gap."

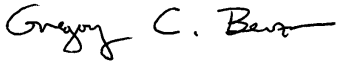
The agenda for the rest of the meeting features keynote speakers giving plenary talks on thought-provoking subjects that feed directly into discussions of major science themes. We also have dedicated time for poster sessions, technical demonstrations, education and outreach activities, and of course, some lively social gatherings. This year's session theme titles are borrowed from the Eagles' greatest hits.

Those of you who have attended past SCEC meetings realize that much of the action happens in the poster sessions. As in the past few years, posters will stay up for the entire meeting to allow more face-to-face interactions on the juicy details of SCEC research. SCEC leadership has a continuing interest in hearing your feedback on ways to improve the meeting, particularly now that it has grown so large.

We welcome to the *Hotel California* those who are new the SCEC Collaboration, and look forward to connecting with our SCEC friends in Palm Springs to celebrate this pivotal year!

Thomas H. Jordan, Outgoing Director

John E. Vidale, Incoming Director



Gregory C. Beroza, Co-Director

Go to meeting website:
www.scec.org/meetings/2017/am

@SCEC #scecmeet

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Saturday, September 9

09:00 - 17:00 **CSEP Workshop: Informing Earthquake Debates with CSEP Results,** *Maximilian Werner, Thomas Jordan, Warner Marzocchi, Andy Michael, and David Rhoades* (https://www.scec.org/workshops/2017/csep)

09:00 - 17:00 **Toward a SCEC Community Rheology Model: Technical Activity Group Kickoff and Workshop,** *Elizabeth Hearn, Michael Oskin, Greg Hirth, Whitney Behr and Wayne Thatcher* (https://www.scec.org/workshops/2017/crm)

09:00 - 17:00 **Workshop on Nonlinear Shallow Crust Effects,** *Domniki Asimaki and Ricardo Taborda* (https://www.scec.org/workshops/2017/shallowcrust)

Sunday, September 10

09:00 - 12:30 **SCEC Special Projects Planning Meeting,** *Christine Goulet*

13:30 - 17:00 **Workshop: Public Communications Theory and Practice for Scientists,** *Jason Ballmann, Mark Benthien, and Zachary Hall* (https://www.scec.org/workshops/2017/communications)

13:00 - 17:00 **Workshop: Creating an Updated Version of the Community Fault Model (CFM) for Use by Earthquake Simulators,** *Terry Tullis, Michael Barall, Jim Dieterich, Ned Field, and Scott Marshall* (https://www.scec.org/workshops/2017/cfm)

10:00 - 22:00 **SCECmeetUP Space Available,** *Tapestry Room*

To faciliate informal, small group discussions at the SCEC Annual Meeting, some rooms have been made available for anyone to use without reservations (Tapestry Room and Palm Canyon Room) at designated times. Meeting rooms for groups up to 24 people are also available with reservations for 2-hour blocks. See the sign-up sheet in the Hilton Lobby to reserve a room for your group.

13:00 - 17:00 **SCEC Annual Meeting Registration & Check-In,** *Hilton Lobby*

15:00 - 17:00 **Poster Set-Up,** *Plaza Ballroom*

17:00 - 18:00 **Wecome Social,** *Hilton Lobby and Plaza Ballroom*

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

Science in Society: Bridging the Gap, *Lucile M Jones*

Society needs science-based decision making now more than ever, as the vulnerability of society is being magnified through population growth in hazardous regions and by the fragility of increasingly complex cities. Although the understanding of natural hazards derived from scientific investigations can and has been used to reduce the impacts of many natural hazards, we often see science ignored or misunderstood. The reasons for the miscommunication include 1) the normalization bias that convinces decision-makers that preparing for the events of last few decades means that we are as prepared as we need to be, 2) the human need to reject randomness and form patterns (even when specious) to protect ourselves, 3) the desire of scientists to pursue the interesting questions which means we focus on uncertainties and what we don't know and rarely take the time to communicate the consensus and what we do know, and 4) the need most people have for stories and emotional connections to being able to understand the implications of information.

These differences can be overcome. In the last few years, collaborations with the City of Los Angeles and the 191 other cities of Southern California through the Southern California Association of Governments (SCAG) have led to substantial improvements in seismic resilience across the region. SCEC's science is being used to evaluate vulnerabilities and look for solutions. This talk will explore some of the reasons for the recent successes and what scientists and decision makers can do to further improve the communication between science and society.

Dr. Lucy Jones is the founder of the Dr. Lucy Jones Center for Science and Society, with a mission to foster the understanding and application of scientific information in the creation of more resilient communities. She is also a Research Associate at the Seismological Laboratory of Caltech, a post she has held since 1984. Working with both the public and private sectors, Dr. Jones seeks to increase communities' ability to adapt and be resilient to the dynamic changes of the world around them. The aim is to understand and communicate where the greatest vulnerabilities lie and what actions can be taken to reduce the risk that are the most cost-effective. With a Bachelor of Arts in Chinese Language and Literature from Brown University and a Ph.D. in Geophysics from MIT, Dr. Jones has been active in earthquake research for decades, furthering earthquake risk reduction through seismological research and integrated disaster scenarios.

19:00 - 21:00 **Welcome Dinner,** *Hilton Poolside*

19:00 - 21:00 **Leadership Meeting: SCEC Advisory Council,** *Palm Canyon Room*

21:00 - 22:30 **Poster Session,** *Plaza Ballroom*

Monday, September 11

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

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

07:00 - 08:00 **SCEC Transitions Program Breakfast,** *Tapestry Room*

The Office of Experiential Learning and Career Advancement (ELCA) is proud to launch the SCEC Transitions Program to provide junior members of the SCEC community with resources and mentoring across key career transitions. At the 2017 SCEC Annual Meeting, ELCA will host two breakfasts to connect early career attendees with peers and mentors for the purpose of sharing experiences and strategies to navigate the challenging career transitions—from undergraduate to graduate school, from graduate school to professional career, from academia to industry...or back again. (www.scec.org/workshops/2017/transitions)

08:00 - 10:00 **Plenary Session 1: "The Long Run" The State of SCEC,** *Horizon Ballroom*

08:00 Welcome and State of the Center (Tom Jordan / John Vidale)

08:20 Agency Report: National Science Foundation (Maggie Benoit)

08:35 Agency Report: U.S. Geological Survey (Bill Leith)

08:50 Communication, Education, & Outreach (Mark Benthien)

09:10 SCEC Science Accomplishments (Greg Beroza)

09:40 - 10:00 Break

10:00 - 11:00 **Plenary Session 2: "Hotel California" The Case for SCEC,** *Horizon Ballroom*
Tom Jordan (SCEC Director 2002-2017)

10:00 - 22:00 **SCECmeetUP Space Available,** *Palm Canyon Room*

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11:00 - 12:30 **Plenary Session 3: "Take It to the Limit" Physics-Based Seismic Hazard Analysis,** *Horizon Ballroom*
Moderators: Christine Goulet, Ned Field

11:00 **10 years of CyberShake: Where are we now and where are we going with physics-based PSHA?** *Scott Callaghan, Robert W Graves, Kim B Olsen, Yifeng Cui, Kevin R Milner, Christine A Goulet, Philip J Maechling, and Thomas H Jordan*

2017 marks 10 years of development on SCEC's physics-based probabilistic seismic hazard analysis (PSHA) platform, CyberShake. CyberShake establishes an updated PSHA methodology that utilizes multiple SCEC community products, including UCERF to provide an earthquake rupture forecast (ERF), UCVM, to generate velocity meshes from SCEC community models, AWP-ODC code, to calculate Strain Green Tensors (SGTs), and Broadband Platform rupture generators to produce individual rupture realizations. These elements are combined via scientific workflows to enable computation of a complete set of PSHA data, including rupture realizations, seismograms, intensity measures, duration metrics, hazard curves, and hazard maps.

We will present results from the most recent CyberShake Studies, 15.4 and 17.3, produced on the largest open-science supercomputers. CyberShake Study 15.4 calculated a seismic hazard model for Southern California at 336 sites at 1 Hz using a tomographically-derived 3D velocity model. Using averaging-based factorization techniques, we can decompose CyberShake variability into source, site, path, and directivity effects, enabling direct comparison of this study with ground motion prediction equation (GMPE)-based PSHA results. We find that physics-based simulations, by capturing directivity and basin effects, have the potential to lower previously unexplained variability in the GMPEs, decreasing hazard estimates at high ground motions by orders of magnitude. In Study 17.3, CyberShake was migrated to the Central California region for the first time. PSHA results for two seismic hazard models, generated using a 3D tomographically produced velocity model and a regionally averaged 1D model, were calculated at 438 sites at 1 Hz. Of particular interest is the basin response in the southern San Joaquin Valley, lower than that for smaller basins as well as GMPE predictions.

We will discuss how CyberShake extends existing PSHA methods, and describe applications of the rich CyberShake dataset, including improving earthquake early warning algorithms (Böse et al., 2014), evaluating building response (Deierlein et al., 2016), and as input to seismic codes through the SCEC UGMS committee. Finally, we will outline future plans for CyberShake, including integrating new ERFs, integrating physics for high frequency ground motions, and migrating the methodology to new geographic regions, while remaining computationally tractable.

11:30 **Characterization of spatial correlations in ground motions—insights from physics-based simulations,** *Jack W Baker and Yilin Chen*

This talk presents statistical methods to quantify spatial correlations in the intensity of ground shaking across a region in a given earthquake, using observed and simulated ground motions. Risk assessment of spatially distributed building portfolios or infrastructure systems requires such quantification in order to predict the spatial extent of damage and impacts. This talk will first review techniques to perform such analysis using observed ground motions from past earthquakes, and describe how these results can be used in probabilistic seismic risk assessment of spatially-distributed lifelines. Quantification using past earthquakes is challenging due to limited observational data, and requires assumptions regarding stationarity of correlations across space and from earthquake to earthquake. As an alternative, physics-based simulations can be used to estimate correlations, and can overcome the constraints from limited data faced when performing empirical estimation. Results from CyberShake simulations are presented, and used to illustrate apparent nonstationarity present in the simulated ground motions from location to location and rupture to rupture. While measurement of these correlations is not necessary in some sense, because they are already implicitly present in the simulations, the results do serve two useful purposes. First, the results serve as a validation metric that can be used to compare simulations to observed ground motions. Second, the results provide insights into the role of source and path properties on resulting spatial correlations, and these insights are useful in regions of the world where comparable simulated ground motions are not available.

12:00 Discussion

12:30 - 13:30 Lunch, *Hilton Restaurant, Tapestry Room, and Poolside*

13:00 - 17:00 **SCEC Annual Meeting Registration & Check-In,** *Hilton Lobby*

13:30 - 15:00 **Plenary Session 4: "One of These Nights" Collaboratory for the Study of Earthquake Predictability and Operational Earthquake Forecasting,** *Horizon Ballroom*
Moderators: Max Werner, Morgan Page

13:30 **Earthquake Forecasting in recent large events in New Zealand and the role of CSEP,** *Matthew C Gerstenberger, David A Rhoades, Annemarie Christophersen, Bill Fry, Laura M Wallace, Graeme McVerry, and Nick Horspool*

The November 14th, 2016, Mw 7.8 Kaikoura earthquake generated significant shaking and damage throughout a large part of central New Zealand. The recovery effort has been distributed over a very large area and the dissemination of information about the potential for future shaking has been an integral part of the GNS Science response. Through the nature of the event and the varied recovery efforts we have been required to provide model results that spanned from aftershock probability tables through to detailed and specific engineering information. Additionally, the main shock triggered three slow slip events (SSE) on the Hikurangi subduction zone that were unique in character in our approximately 20 years of observations. These SSE have provided a difficult and interesting challenge to the ongoing forecasting efforts.

Our overriding philosophy remains that no single model sufficiently captures our current understanding of earthquake occurrence and that by using a hybrid of multiple models, we best capture the uncertainty in our knowledge of future quakes. To this point, and similar to past New Zealand earthquakes, we have used a hybrid forecast model based on the the STEP, ETAS, and EEPAS models, which we have combined with a range of long-term models, including a new strain-rate based model. We have used this hybrid model to produce forecasts from 1-day to 100-years. New Zealand end-users have become increasingly sophisticated in their uptake of forecasting information with increasing requests and needs from across sectors. A noticeable change in the Kaikoura response was the desire for forecast information not only to provided in seismic hazard terms, but in very specific risk terms for government and industry decision making.

In the past seven years, New Zealand has experienced around 15 large earthquakes which have required a forecasting response. Our forecast response has heavily relied on both what we have learned from CSEP and from response-specific projects that have been conducted within the CSEP framework. In this presentation, I will discuss our forecast models, the engineering outputs developed, our efforts to estimate the impact of the SSE on the potential for triggered earthquakes, and finally, the role CSEP and the SCEC community have played in our ongoing forecast efforts.

14:00 **Progresses and challenges for Operational Earthquake Forecasting in Italy,** *Warner Marzocchi*

Society needs science-based decision making now more than ever, as the vulnerability of society is being magnified through population growth in hazardous regions and by the fragility of increasingly complex cities. Although the understanding of natural hazards derived from scientific investigations can and has been used to reduce the impacts of many natural hazards, we often see science ignored or misunderstood. The reasons for the miscommunication include 1) the normalization bias that convinces decision-makers that preparing for the events of last few decades means that we are as prepared as we need to be, 2) the human need to reject randomness and form patterns (even when specious) to protect ourselves, 3) the desire of scientists to pursue the interesting questions which means we focus on uncertainties and what we don't know and rarely take the time to communicate the consensus and what we do know, and 4) the need most people have for stories and emotional connections to being able to understand the implications of information.

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14:30 Discussion

14:00 - 22:00 **SCECmeetUP Space Available,** *Tapestry Room*

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15:00 - 17:00 **Poster Session,** *Plaza Ballroom*

15:00 - 18:00 **Leadership Meeting: SCEC CEO Planning Committee,** *Oasis Room II*

19:00 - 22:00 **SCEC Honors Banquet: "Tequila Sunrise" Tribute to SCEC Director Tom Jordan,** *Woodstock Ballroom at Hard Rock Hotel*

Tuesday, September 12

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

07:00 - 08:00 **SCEC Transitions Program Breakfast,** *Tapestry Room*

The Office of Experiential Learning and Career Advancement (ELCA) is proud to launch the SCEC Transitions Program to provide junior members of the SCEC community with resources and mentoring across key career transitions. At the 2017 SCEC Annual Meeting, ELCA will host two breakfasts to connect early career attendees with peers and mentors for the purpose of sharing experiences and strategies to navigate the challenging career transitions—from undergraduate to graduate school, from graduate school to professional career, from academia to industry...or back again. (www.scec.org/workshops/2017/transitions)

08:00 - 10:00 **Plenary Session 5: "New Kid in Town" The Future of SCEC,** *Horizon Ballroom*

08:00 Vision for SCEC (John Vidale)

08:30 Discussion

08:45 SCEC Science Collaboration (Greg Beroza/Judi Chester)

09:15 SCEC Special Projects (Christine Goulet)

09:45 SCEC Communication, Education, & Outreach (Mark Benthien)

10:00 - 10:30 Break

10:00 - 22:00 **SCECmeetUP Space Available,** *Palm Canyon Room*

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10:30 - 12:00 **Plenary Session 6: "Life in the Fast Lane" Earthquake Gates Area Initiative,** *Horizon Ballroom*
Moderators: Kate Scharer, Mike Oskin

10:30 **Framing the EGA: Limits and Opportunities,** *Kate Scharer*

10:40 **Introducing the Cajon Pass Earthquake Gate Area,** *Julian C Lozos, Craig Nicholson, and Nate W Onderdonk*

Cajon Pass is the primary junction between the San Andreas (SAF) and San Jacinto (SJF) faults. Its location in western San Bernardino County – in the middle of the densely populated Inland Empire – means that even a local rupture within the Pass could have a considerable impact on cities and lifelines. Fault interactions within the Pass may also control whether rupture is able to continue toward Los Angeles and the western Transverse Ranges. Thus, understanding fault interactions and possible rupture behaviors in Cajon Pass affects our understanding of hazard throughout the southern San Andreas system.

A number of eastern Transverse Ranges faults of different types may also interact with the SAF and SJF within Cajon Pass. Even from a purely geometrical standpoint, the multi-stranded nature of this junction raises the question of whether it functions as an earthquake gate. However, there are also a number of geological and geophysical observations and models that support the

idea of Cajon Pass as a behavioral boundary within the southern San Andreas system. Geology and geodesy alike show a decrease in slip rate on the SAF south of Cajon Pass, while the slip rate increases along the subparallel SJF. Seismicity highlights a rotation of the regional stress field to the immediate south of the SAF-SJF junction. Paleoseismology suggests that many SAF ruptures stop at Cajon Pass, and that the event record on the SAF north of the junction better correlates with the record on the SJF than it does with the record on the SAF to the south. Rupture modeling corroborates the idea that the SAF and SJF can rupture together in a single event. The distribution of precariously balanced rocks near the SAF and SJF may also imply that directivity plays a role in how rupture negotiates the junction.

Here, I will go into more depth on the previous research that motivates the concept of Cajon Pass as an Earthquake Gate. I will also introduce the key research questions raised by the Cajon Pass EGA leaders.

11:05 **Applying Paleo-earthquake Data to Query for Earthquake Gate Areas,** *Egill Hauksson, and Men-Andrin Meier*

Over geological time, plate motion and associated tectonic processes have created the geophysical conditions under which the San Andreas Fault (SAF) operates. These conditions influence earthquake processes on both short and long time scales because rupture processes initiate locally and change the state of stress as they rupture. In turn over many earthquake cycles they evolve the long-term stress and frictional conditions of the SAF. For the last ~4 million years the San Andreas Fault (SAF) has accommodated approximately two thirds of the plate motion between the Pacific and North America plates in southern California. We investigate correlations between paleo-earthquake rupture models and modern geophysical data to search for possibly related variations in the geophysical data. Unusual stress state, seismicity, and fault complexities could be associated with initiation or termination of past ruptures, or earthquake gate areas. The two most prominent possible gate areas coincide with the two big bends in the SAF, near Gorman and White Water. The Mojave and San Bernardino segments that are not aligned with the plate motion appear to have three additional gate areas, including Cajon Pass. These gate areas that are imaged as changes in state of stress and seismicity may have been constructed by past earthquake ruptures predominantly approaching from the Chalome segment to the north or the Coachella Valley segment to the south. Alternatively, these gate areas have evolved over time as the SAF was shaped by long-term regional tectonics, including block rotations or underplating beneath San Gorgonio Pass. Reconciling modern geophysical data with paleo-earthquake data will improve understanding of earthquake rupture mechanisms taking place at different time and spatial scales. This effort will also improve our understanding of the rheology of the plate boundary system and may ultimately improve seismic hazard assessment.

11:30 Discussion: How to get involved in EGA

12:00 - 13:30 Lunch, *Hilton Restaurant, Tapestry Room, and Poolside*

13:30 - 15:00 **Plenary Session 7: "Take It Easy" SCEC Community Models,** *Horizon Ballroom*
Moderators: Liz Hearn, Scott Marshall

13:30 **Strategies for building community-based geodetic models of fault slip rates,** *Eileen L Evans*

Developing a comprehensive model of tectonic continental deformation requires assessing 1) fault slip rates, 2) off-fault deformation rates, and 3) realistic uncertainties. Fault slip rates can be estimated by modeling fault systems based on space geodetic measurements of active surface ground displacement, such as Global Navigation Satellite Systems (GNSS) and interferometric synthetic aperture radar (InSAR). However, geodetic slip rate estimates may vary widely due to measurement and epistemic (model) uncertainties, which poses a challenge for both estimating slip rates and accurately characterizing uncertainties. Furthermore, differing modeling assumptions may represent ongoing scientific disagreements (e.g., block models vs. distributed deformation) that should be captured in a community model. Taking an alternative yet complementary approach to the SCEC community geodetic model (CGM), which integrates geodetic data into a model of active deformation, I compile estimated fault slip rates from 33 published models in California to determine average geodetic slip rates and assess model uncertainties. Because geodetic slip rate models may vary in the number of faults represented and the precise location of those faults, I combine these models on a common georeferenced grid and calculate spatially averaged long-term deformation within each grid cell. Averaging over multiple published models produces a community-averaged long-term deformation model of California, and standard deviation provides a measure of model uncertainty. This approach enables holistic comparison with geologic slip rates, reveals gaps in model coverage, and provides insights into the role of model uncertainties in estimates of off-fault deformation.

14:00 **The 2016 Mw 7.8 Kaikoura Earthquake: Perspectives from Earthquake Geology into Seismic Hazard,** *Robert M Langridge, Pilar Villamor, Nicola Litchfield, Russ J Van Dissen, Kate Clark, William Ries, Jesse Kearse, Timothy Little, Matthew C Gerstenberger, Tatiana Goded, and the Kaikoura Earthquake Response Team*

The 14 November 2016 (local time) Mw 7.8 Kaikōura earthquake, New Zealand is an exceptional example of multi-fault rupture and efforts to document the extent and character of fault rupture will provide a valuable case study of end-member fault rupture complexity. Surface rupture occurred on at least 14 named South Island faults with co-seismic surface slip of ≥1.5 m between North Canterbury, Marlborough and Cook Strait broadly spanning a plate boundary transition from oblique subduction to continental collision. The pattern of surface faulting is highly complex and occurred over a length of c. 180 km from mountain to coastal and submarine environments. There are many lessons for us to take from this event, as our observations show there was highly variable structural styles of rupture, jumps across tectonic domains and exceptional stepover sizes between ruptures, and the rupture of faults with slip rates and recurrence intervals varying by an order of magnitude all rupturing in the

single event. These provide several important implications for seismic hazard modelling of multi-segment ruptures. The purpose of this talk will be to highlight the scale and complexity of surface ruptures and coastal deformation, with an emphasis on the high-slip Papatea, Kekerengu and Jordan faults in the northern part of the fault rupture zone. We will describe the variety of new techniques to map fault ruptures and understand microblock tectonics, and describe how observations from earthquake geology are being used to update seismic hazard models in the northern South Island.

14:30 Discussion

14:00 - 22:00 **SCECmeetUP Space Available,** *Tapestry Room*

To faciliate informal, small group discussions at the SCEC Annual Meeting, some rooms have been made available for anyone to use without reservations (Tapestry Room and Palm Canyon Room) at designated times. Meeting rooms for groups up to 24 people are also available with reservations for 2-hour blocks. See the sign-up sheet in the Hilton Lobby to reserve a room for your group.

15:00 - 16:00 **Cajon Pass EGA Collaboration Discussion,** *Horizon Ballroom*

15:00 - 17:00 **Poster Session,** *Plaza Ballroom*

21:00 - 22:30 **Poster Session,** *Plaza Ballroom*

Wednesday, September 13

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

08:30 – 08:30 **Report from the Advisory Council,** *Horizon Ballroom*
Meghan Miller (SCEC AC Chair)

08:30 - 10:00 **Plenary Session 8: "Desperado" From Hazard to Risk,** *Horizon Ballroom*
Moderators: Annemarie Baltay, Jon Stewart

08:30 **The Limits of Earthquake Early Warning,** *Sarah E Minson, Annemarie S Baltay, Elizabeth S Cochran, Thomas C Hanks, and Men-Andrin Meier*

The objective of earthquake early warning (EEW) is to provide population centers with a useful warning of impending strong ground shaking: the warning must be sufficiently rapid and accurate for users to take action to mitigate damage. By considering the time scale of evolving moment release and observed ground motion variability, we find that EEW systems may perform quite differently than previously understood. Many current-generation EEW systems estimate the location and magnitude of an earthquake in real-time and input this information into a Ground Motion Prediction Equation (GMPE) to identify and alert people and infrastructure expected to experience strong shaking before that shaking arrives at their location. Much of our theoretical knowledge of how these systems behave relies on the assumption that the final earthquake magnitude can be known at the beginning of the rupture and that the predicted ground motion from this source is accurate. Removing these assumptions, we find that the timeliness of alerts depends strongly on the level of ground motion for which users want to be warned. To estimate that a user will experience ground motion exceeding a higher threshold, the EEW system must wait until the rupture grows larger, which cuts into potential warning time. Thus, we cannot expect long warning times for destructive levels of ground motion. Further, even if alerts are timely, they often will be inaccurate. Observed ground motion typically has a factor of two variability (one standard deviation) about the median expected ground motion predicted by a GMPE. As a result, ground motion predictions – including those based on accurate source parameters – will occasionally greatly under-estimate or over-estimate the ground motion the user will experience, resulting in missed alerts and false alarms, respectively. For false-alarm-tolerant users, EEW performance is optimized by taking action at low ground motion levels, improving alert timeliness and decreasing the number of missed events at the expense of more false alarms.

09:00 **A Vision for Regional Performance-Based Seismic Assessment,** *Ertugrul Taciroglu*

Recent advances in performance-based seismic engineering and in existing information technologies provide opportunities to develop extremely granular inventories of the built environment and assess its vulnerabilities to earthquakes. This presentation focuses on bridges—which are arguably the most critical elements of a transportation network—and delineates the ingredients needed to bring a regional seismic assessment tool to fruition. These ingredients range from site-specific ground motion estimation to automated development of bridge models using data harvested from publicly available data repositories, to damage and economic loss assessment. After identifying the ingredients, an overall framework is articulated for regional risk assessment of transportation networks. Several application examples are provided to demonstrate the viability of the envisioned approach.

09:30 Discussion

10:00 - 10:15 **Demonstration of Temblor,** *Horizon Ballroom*
Ross Stein

10:15 - 10:30 Break

10:30 - 12:00 **Plenary Session 9: "Already Gone" Post-Earthquake Response,** *Horizon Ballroom*
Moderators: Mike Oskin, Jamie Steidl

10:30 **The HayWired Scenario — How can the San Francisco bay region bounce back better?** *Kenneth W Hudnut, Anne M Wein, Dale A Cox, Suzanne C Perry, Keith A Porter, Laurie A Johnson, and Jennifer A Strauss*

Society needs science-based decision making now more than ever, as the vulnerability of society is being magnified through population growth in hazardous regions and by the fragility of increasingly complex cities. Although the understanding of natural hazards derived from scientific investigations can and has been used to reduce the impacts of many natural hazards, we often see science ignored or misunderstood. The reasons for the miscommunication include 1) the normalization bias that convinces decision-makers that preparing for the events of last few decades means that we are as prepared as we need to be, 2) the human need to reject randomness and form patterns (even when specious) to protect ourselves, 3) the desire of scientists to pursue the interesting questions which means we focus on uncertainties and what we don't know and rarely take the time to communicate the consensus and what we do know, and 4) the need most people have for stories and emotional connections to being able to understand the implications of information.

11:00 **Post-Earthquake Reconnaissance: a Structural Engineer's Perspective,** *Silvia Mazzoni*

Post-Earthquake Reconnaissance gives a first-hand opportunity to observe the effects of an earthquake on a human scale. During a reconnaissance, we gather data and knowledge, as well as an understanding and appreciation of the interdependencies between the different aspects of a society, or fields of study. Seismologists and geotechnical engineers collect field data that helps to understand the mechanisms involved in fault mechanics, wave propagation, and site amplification. As they compare different geologic regions and locations with respect to the seismogenic source, they identify source, path and local effects. Structural engineers look at the response of structures, such as buildings and bridges, and evaluate the interaction between these effects with the structures' vulnerabilities and strengths to assess the mechanisms controlling structural response. To evaluate different building characteristics, a structural engineer looks at the response of a cluster of structures that are expected to have similar site response and determines the cause of the different structural response. During reconnaissance, we often observe adjacent buildings with very different responses, where one building may have no damage, the other may have collapsed -- the differences may be as obvious as the fact that one was strengthened while the other wasn't. In this case, we learn the effectiveness of strengthening. In other cases, where differences in response are not as drastic, nor obvious, we look at the hidden details to learn about structural mechanics. That gained knowledge improves our building practices and policies. The one feature of an earthquake which structural engineers find only in reconnaissance and not in the laboratory or computer simulation is the human component: the story of the three little pigs isn't about what type of building is strongest, but about the type of effort people, and society, invest into their infrastructure.

11:30 Discussion

12:00 - 12:15 **Directors' Closing Remarks,** *Horizon Ballroom*
John Vidale (SCEC Director) and Greg Beroza (SCEC Co-Director)

12:15 2017 SCEC Annual Meeting Adjourns

12:15 - 14:30 **Leadership Meeting: SCEC Planning Committee,** *Palm Canyon Room*

12:15 - 14:30 **Leadership Meeting: SCEC Board of Directors,** *Tapestry Room*

Poster Sessions

View full abstracts at www.scec.org/meetings/2017/am

Sunday, September 10, 2017

15:00 – 21:00 Poster Set-Up

21:00 – 22:30 Poster Session 1

Monday, September 11, 2017

15:00 – 17:00 Poster Session 2

Tuesday, September 12, 2017

15:00 – 17:30 Poster Session 3

21:00 – 22:30 Poster Session 4

Earthquake Forecasting and Predictability (EFP)

Posters 001-018

001 **Repeating Earthquakes Trigger Themselves in Parkfield,** *Justin L Rubinstein, and William L Ellsworth*

002 **Natural Time and Nowcasting Induced Seismicity at the Groningen Gas Field in the Netherlands,** *Molly Luginbuhl, Donald L Turcotte, and John B Rundle*

003 **Towards Testing Probabilistic Seismic Hazard Estimates,** *Mostafa Mousavi, and Gregory C Beroza*

004 **Space-time earthquake rate models for one-year hazard forecasts in Oklahoma,** *Andrea L Llenos, and Andrew J Michael*

005 **Annual Earthquake Potential Consultation: A Real Forward Prediction Test in China,** *Yongxian Zhang, Zhongliang Wu, Xiaotao Zhang, and Gang Li*

006 **On secular spatial seismicity,** *Yosihiko Ogata*

007 **Model-free aftershock forecasts constructed from similar sequences in the past,** *Nicholas J van der Elst, and Morgan T Page*

008 **Nonparametric Hawkes models with strike angle covariates,** *Frederic P Schoenberg, and James Molyneux*

009 **Clustering features of seismicity in Italy during 2005 to 2016,** *Jiancang Zhuang, Yicun Guo, Maura Murru, Giuseppe Falcone, and Elisa Tinti*

010 **Earthquake forecasts and their applications following the M7.8 2016 Kaikoura earthquake,** *David A Rhoades, Matthew C Gerstenberger, Annemarie Christophersen, and David S Harte*

011 **Performance enhancements and visualization for RSQSim earthquake simulator,** *Dmitry Pekurovsky, Amit Chourasia, Keith B Richards-Dinger, Bruce E Shaw, James H Dieterich, and Yifeng Cui*

012 **Are Physics-Based Simulators Ready for Prime Time? Comparisons of RSQSim with UCERF3 and Observations,** *Kevin R Milner, Bruce E Shaw, Jacquelyn J Gilchrist, and Thomas H Jordan*

013 **Conditional Probabilities of Large Earthquake Sequences in California from the Physics-based Rupture Simulator RSQSim,** *Jacquelyn J Gilchrist, Thomas H Jordan, Bruce E Shaw, Kevin R Milner, Keith B Richards-Dinger, and James H Dieterich*

014 **Striking agreement of physics-based earthquake simulator and UCERF3 California seismic hazard model,** *Bruce E Shaw, Kevin R Milner, Edward H Field, Keith B Richards-Dinger, Jacquelyn J Gilchrist, James H Dieterich, and Thomas H Jordan*

015 **Prospective test of the 1995 WGCEP SoCal earthquake forecast,** *David D Jackson*

016 **Earthquake Potential in California-Nevada Implied by Correlation of Strain Rate and Seismicity,** *Yuehua Zeng, Mark D Petersen, and Zheng-Kang Shen*

017 **Characterizing the Triggering Susceptibility of Characteristic Faults,** *Morgan T Page, Nicholas J van der Elst, and Bruce E Shaw*

018 **An Overview of the 3rd Uniform California Earthquake Rupture Forecast (UCERF3),** *Edward H Field, and Other WGCEP Participants*

SCEC Special Projects

Posters 019-025

019 **Application of array-based early warning system to tsunami offshore Ventura, California,** *Yuqing Xie, and Lingsen Meng*

020 **Seismic source and path parameters in Central California estimated with recorded ground motion,** *Jorge G Crempien, and Ralph J Archuleta*

021 **Methodology for Incorporation of 3-D Simulation Results into Non-Ergodic Ground-Motion Models for Central California,** *Kathryn E Wooddell, and Norman A Abrahamson*

022 **Towards a High-Resolution Velocity Model with a Very Dense Array at Diablo Canyon, California,** *Nori Nakata, and Gregory C Beroza*

023 **Detecting Micro-seismicity and Long-duration Tremor-like Events from the Oklahoma Wavefield Experiment,** *Zhigang Peng, Chenyu Li, Zefeng Li, Chengyuan Zhang, and Nori Nakata*

024 **Efficient blind search for small similar-waveform earthquakes in a decade of continuous seismic data (2007-2017) in coastal central California,** *Clara Yoon, Karianne Bergen, Kexin Rong, Hashem Elezabi, Peter Bailis, Philip Levis, and Gregory C Beroza*

025 **Automated Waveform Assembling for Full-3D Tomography,** *Alan Juarez, and Thomas Jordan*

026 **Geometry of the Los Angeles Basin Using Full H/V Spectral Ratio Inversion,** *Zack Spica, Mathieu Perton, Robert W Clayton, and Gregory C Beroza*

027 **Stress- and structure-induced anisotropy in Southern California from two-decades of shear-wave splitting measurements,** *Zefeng Li, and Zhigang Peng*

028 **Towards Structural Imaging Using Scattering Artifacts Detected in Ambient Field Correlations,** *Lise Retailleau, and Gregory C Beroza*

029 **Imaging the San Gabriel and San Bernardino Basins with short-term Nodal deployments,** *Robert W Clayton, Fan-Chi Lin, Marine A Denolle, Patricia Persaud, and Jascha Polet*

030 **Crust azimuthal anisotropy beneath the eastern Tibetan Plateau revealed by ambient noise tomography,** *Xue-Wei Bao, and Xiaodong Song*

031 **On the Properties of Higher-Order Ambient Field Correlation,** *Yixiao Sheng, Nori Nakata, and Gregory C Beroza*

032 **Ground motion coherence study in multiple distance ranges and frequency bands,** *Lei Qin, Yehuda Ben-Zion, and Frank L Vernon*

033 **Shallow Earth Structure from Wind-Induced Ground Motion,** *Jiong Wang, and Toshiro Tanimoto*

034 **3-D Velocity Model of the Coachella Valley Determined Using P-Wave First Arrival Times from the Salton Seismic Imaging Project and Local Earthquakes,** *Rasheed Ajala, Patricia Persaud, Joann M Stock, Gary S Fuis, John A Hole, Mark R Goldman, and Daniel S Scheirer*

035 **Separating non-diffuse component from ambient seismic noise cross-correlation in southern California¬¬,** *Xin Liu, Gregory C Beroza, and Nori Nakata*

036 **Strong SH-to-Love Wave Scattering off the Southern California Continental Borderland,** *Zhongwen Zhan, Chunquan Yu, Egill Hauksson, and Elizabeth S Cochran*

037 **Eikonal Tomography of the Southern California Plate Boundary Region,** *Hongrui Qiu, Yehuda Ben-Zion, and Fan-Chi Lin*

038 **Attenuation Tomography at High Frequencies in Southern California,** *Yu-Pin Lin, and Thomas H Jordan*

039 **Stochastic Representations of Seismic Anisotropy: Verification of Effective Media Models for Locally Isotropic 3D Heterogeneity,** *Xin Song, Thomas H Jordan, and David A Okaya*

040 **Rocking the Boat: Poro-elastic Stress Change at Seismogenic Depth Associated with Oil Production in the Los Angeles Basin in the Early 20th Century,** *Susan E Hough, and Roger Bilham*

041 **Shallow crustal imaging in Southern California using ambient noise and fault zone trapped waves,** *Fan-Chi Lin, Elizabeth Berg, Amir A Allam, Hongrui Qiu, Yadong Wang, and Yehuda Ben-Zion*

042 **Microseismic events associated with the Oroville Dam spillway,** *Rob Skoumal, Ezer Patlan, Phillip B Dawson, J. Ole Kaven, and Stephen H Hickman*

043 **Reanalyzing the Rangely earthquake control experiment using machine learning,** *Kaiwen Wang, William L Ellsworth, and Gregory C Beroza*

044 **A systematic assessment of the spatio-temporal evolution of fault activation through induced seismicity in Oklahoma and southern Kansas,** *Martin Schoenball, and William L Ellsworth*

045 **Permeability Changes Observed in the Arbuckle Group Coincident with Nearby Earthquake Occurrence,** *Elizabeth S Cochran, Kayla A Kroll, Keith B Richards-Dinger, and Kyle D Murray*

046 **Large-N array observations of injection-induced seismicity in northern Oklahoma: the LASSO experiment,** *Sara L Dougherty, Elizabeth S Cochran, and Rebecca M Harrington*

047 **Two years stress drop estimates for induced earthquakes in Oklahoma,** *Nana Yoshimitsu, William L Ellsworth, Gregory C Beroza, and Martin Schoenball*

048 **Identifying Long Period Long Duration Events Spatially Associated With Hydraulic Stimulation Operations,** *Robert L Walker, Abash Kumar, Richard Hammack, Brian Dressel, William Harbert, and Fred Aminzadeh*

049 **Bayesian source mechanism inversion of induced seismicity in oil/gas fields and pico-seismicity (acoustic emission) in the laboratory,** *Chen Gu, German A Prieto, Ulrich Mok, Youssef M Marzouk, Brian Evans, and Nafi Toksöz*

050 **Are the Stress Drops of Small Earthquakes Good Predictors of the Stress Drops of Larger Earthquakes?** *Jeanne L Hardebeck*

051 **Anomalously large complete stress drop during the 2016 Mw 5.2 Borrego Springs earthquake inferred by waveform modeling and near-source aftershock deficit,** *Zachary E Ross, Hiroo Kanamori, and Egill Hauksson*

052 **Directly Estimating Rupture Area to Remove the Uncertainty in Stress Drop,** *Jeff J McGuire, and Yoshihiro Kaneko*

053 **Towards quasi-automated estimates of directivity and related source properties of small to moderate earthquakes with second seismic moments,** *Haoran Meng, Yehuda Ben-Zion, and Jeff J McGuire*

054 **Testing and Reconciling Stress Drop and Attenuation Models for Southern California,** *Peter M Shearer, Rachel E Abercrombie, and Daniel T Trugman*

055 **Proposed Community Stress Drop Validation Experiment,** *Annemarie S Baltay, William L Ellsworth, Martin Schoenball, and Gregory C Beroza*

056 **Detailed observations of seismicity, stress drop and directivity on a complex fault structure in Mogul Nevada,** *Rachel E Abercrombie, Christine J Ruhl, and Ken D Smith*

057 **Preliminary insights into the fault geometry and rupture history of the 2016 Mw 7.8 Kaikoura, New Zealand, earthquake,** *Mareike N Adams, and Chen Ji*

058 **Analysis of Two Magnitude ~4 Earthquakes and Aftershocks Near Truckee, California, 2017,** *Rachel L Hatch, Ken D Smith, and Rachel E Abercrombie*

059 **Thermomechanical earthquake cycle simulations with rate-and-state friction and nonlinear viscoelasticity,** *Kali L Allison, and Eric M Dunham*

060 **Reconciling Fault Geometry in Nepal Himalaya using the "NAMASTE" Seismic Network,** *Manuel M Mendoza, Abhijit Ghosh, Marianne S Karplus, John Nabelek, Soma S Sapkota, Lok B Adhikari, Simon L Klemperer, and Aaron A Velasco*

061 **Frequency-Dependent Tidal Triggering of Low Frequency Earthquakes Near Parkfield, California,** *Lian Xue, Roland Bürgmann, and David R Shelly*

062 **Dynamic triggering of earthquakes north of Xiaojiang Fault, Yunnan,** *Yuexin Li, Roland Bürgmann, Hongfeng Yang, and Shiyong Zhou*

063 **What does an 'average' large subduction earthquake look like?** *Men-Andrin Meier, Jean-Paul Ampuero, and Thomas H Heaton*

064 **Large-scale Acceleration of Slow Slip Before the 2015 Mw 8.4 Illapel, Chile Earthquake,** *Hui Huang, and Lingsen Meng*

065 **Seismicity and tectonic tremor associated with shallow offshore slow slip along the northern Hikurangi Margin, New Zealand,** *Erin Todd*

066 **Continuous Tremor in the Alaska-Aleutian Subduction Zone Detected by Aleutian Array of Arrays,** *Bo Li, Abhijit Ghosh, Clifford H Thurber, and Federica Lanza*

067 **Ambient tectonic tremor in the San Jacinto Fault,** *Alexandra A Hutchison, and Abhijit Ghosh*

068 **Systematic Search for Repeating Earthquakes along the Central San Jacinto Fault,** *Dongdong Yao, Zhigang Peng, Clara Daniels, and Xiaofeng Meng*

069 **Repeating earthquakes detected by a new fast method reveal complex creep behavior in the northern San Francisco Bay Area,** *Nader Shakibay Senobari, and Gareth J Funning*

070 **Linking seismicity and fault surface properties,** *Magali Barba, Kristy F Tiampo, and Margaret T Glasscoe*

071 **Tectonic tremor in San Andreas Fault near Cholame captured by a mini seismic array,** *Kuntal Chaudhuri, and Abhijit Ghosh*

072 **A detailed, automatically-derived, seismicity catalog for the San Jacinto fault zone (1998-2016),** *Malcolm C White, Zachary E Ross, Yehuda Ben-Zion, and Frank L Vernon*

073 **An Improved Method to Determine Coda-Q, Earthquake Magnitude, and Site Amplification: Theory and Application to Southern California,** *Wei Wang, and Peter M Shearer*

074 **Earthquake Monitoring with the MyShake Global Smartphone Seismic Network,** *Asaf Inbal, Qingkai Kong, Richard M Allen, and William H Savran*

075 **Depth Distribution of the 2010 El Mayor-Cucapah Earthquake Sequence (M>=4) Determined from Regional Waveform Modeling,** *Chunquan Yu, Egill Hauksson, Zhongwen Zhan, and Elizabeth S Cochran*

076 **Implementing rapid, probabilistic association of earthquakes with source faults in the CFM for southern California,** *Walker S Evans, Andreas Plesch, Won Lee, Natesh Pillai, John H Shaw, Men-Andrin Meier, and Egill Hauksson*

077 **Obspy, Web Services and Big Data – Using the Southern California Earthquake Data Center (SCEDC) and the Southern California Seismic Network (SCSN) Products and Services for Earthquake Research,** *Ellen Yu, Prabha Acharya, Aparna Bhaskaran, Shang-Lin Chen, Jennifer Andrews, Valerie Thomas, Egill Hauksson, and Robert W Clayton*

078 **A 15-year catalog of more than 1 million low-frequency earthquakes: tracking tremor and slip along the deep San Andreas Fault,** *David R Shelly*

079 **Natural Time and Earthquake Aftershock Entropy,** *Alexis Giguere*

080 **Toward a more robust tsunami early warning system: integration of real-time GPS, strong motion and teleseismic data for fast seismic source inversion,** *Kejie Chen, Zhen Liu, and Tony Song*

081 **Rapid Line-Source and Ground-Motion Estimates for Earthquake Early Warning Using FinDer Version 2,** *Maren Böse, Deborah E Smith, Claude Felizardo, Men-Andrin Meier, Thomas H Heaton, and John Clinton*

082 **The seismological aftermath of the 2016 Mw7.8 Pedernales, Ecuador earthquake,** *Stephen Hernandez*

083 **How NSHMP 2014 and UCERF3 have changed the earthquake risk landscape in the US,** *Marleen Nyst, Delphine D Fitzenz, and Nilesh Shome*

084 **Path and site effects in GMPEs: Incorporating crustal physical properties for region-specific ground motion estimation using small magnitude data from Southern California,** *Valerie J Sahakian, Annemarie S Baltay, Tom C Hanks, Janine Buehler, and Frank L Vernon*

085 **Complex Rayleigh Wave Effects on the Seismic Demands of Mid-Rise Buildings,** *Jorge A Castillo Castellanos, Monica D Kohler, Anthony T Massari, and Robert W Clayton*

Tectonic Geodesy

Posters 086-108

086 **Off-fault deformations and shallow slip deficit from dynamic rupture simulations with fault zone plasticity,** *Daniel Roten, Kim B Olsen, and Steven M Day*

087 **Can deformation rates across the Carrizo Plain segment of the San Andreas Fault be explained by vertical migration of the locked to-creeping transition?** *Lucile Bruhat, and Paul Segall*

088 **Creep avalanches on San Andreas Fault and their underlying mechanism from 19 years of InSAR and seismicity,** *Mostafa Khoshmanesh, and Manoochehr Shirzaei*

089 **A 4-D Earthquake Cycle Model with Lateral Variations in Shear Modulus,** *David T Sandwell, and Bridget R Smith-Konter*

090 **The impact of model prediction error in designing geodetic networks for crustal deformation applications,** *Jessica R Murray*

091 **Production and Uses of Multi-Decade Geodetic Earth Science Data Records,** *Sharon Kedar, Yehuda Bock, Angelyn W Moore, Peng Fang, Anne sullivan, Donald F Argus, Songnian Jiang, and Scott T Marshall*

092 **Red Geodesica del Noroeste de Mexico (REGNOM) in northern Baja California,** *Alejandro Gonzalez-Ortega, Antonio Vidal-Villegas, Elvia Ramon Morales, Armando Valdez, and Sergio M Arregui Ojeda*

093 **USGS Global Positioning System (GPS) Network in Southern California,** *Daniel N Determan, Aris G Aspiotes, Christian Guillemot, John O Langbein, Mark Murray, Marcos Alvarez, and Keith F Stark*

094 **On the Geodetic Signature from Lake Mead Water Levels Fluctuations (1940-2016),** *Debi Kilb, Adrian A Borsa, and Duncan C Agnew*

095 **The Far-Field Effect of Large Earthquakes in GPS Time-Series,** *Zachary M Young, and Corné W Kreemer*

096 **Seismogenic structure and coseismic slip distribution of the 2013 Ms7.0 Lushan earthquake in southwestern China,** *Qi Liu, Xueze Wen, and Zhigang Shao*

097 **A study of the December 2016, The Geysers, CA earthquake using InSAR and GPS,** *Rachel L Terry, Gareth J Funning, and Michael Floyd*

098 **A Systematic Study of Earthquake Detectability Using Sentinel-1 TOPS InSAR,** *Gareth J Funning, and Astrid Garcia*

099 **The M7 2016 Kumamoto, Japan, Earthquake: 3D coseismic deformation from differential topography,** *Chelsea P Scott, Ramon Arrowsmith, Lia J Lajoie, Ed Nissen, Tadashi Maruyama, and Chiba Tatsuro*

100 **Capturing Postseismic Processes of the 2016 Mw 7.1 Kumamoto Earthquake, Japan, Using Dense, Continuous GPS and Short-repeat Time ALOS-2 InSAR Data: Implications for the Shallow Slip Deficit Problem,** *Chris W Milliner, Roland Bürgmann, Teng Wang, Asaf Inbal, David Bekaert, Cunren Liang, and Eric J Fielding*

101 **Postseismic deformation following the 2013 Mw 7.7 Balochistan (Pakistan) earthquake observed with Sentinel-1 Interferometry,** *Kang Wang, and Yuri Fialko*

102 **Northwest Propagation of Postseismic Deformation in the Yuha Desert from the 2010 M7.2 El Mayor – Cucapah Earthquake,** *Andrea Donnellan, Jay W Parker, Robert A Granat, Michael B Heflin, John B Rundle, Lisa Grant Ludwig, Marlon E Pierce, and Jun Wang*

103 **Line-of-Sight Velocity Map along the San Andreas Fault System from GPS and Sentinel-1 InSAR: Contribution to the SCEC Community Geodetic Model,** *Xiaohua Xu, and David T Sandwell*

104 **Integration of InSAR and GPS data for 3-dimensional crustal deformation mapping,** *Zhen Liu, Zheng-Kang Shen, Cunren Liang, and Paul Lundgren*

105 **Toward the 3-component time-dependent Crustal Motion Model: Integration of Sentinel-1 SAR interferometry and continuous GPS,** *Ekaterina Tymofyeyeva, and Yuri Fialko*

106 **Characterizing fault motion using edge detection in radar images,** *Margaret T Glasscoe, Jay W Parker, and Andrea Donnellan*

107 **InSAR coherence time series - soil moisture as a proxy for alluvial fan age?** *Rowena B Lohman, Chelsea P Scott, and Teresa E Jordan*

108 **Towards an Understanding of the Geometry of the Hilton Creek Fault System Within the Long Valley Caldera, Using Ground-Based Magnetics and High-Resolution Topographic Profiles,** *Jason De Cristofaro, and Jascha Polet*

Earthquake Geology — Posters 109-153

109 **Examining earthquake processes with microtextural analysis and (U-Th)/He thermochronometry: a case study from hematite fault mirrors in the Wasatch fault zone,** *Robert McDermott, Alexis K Ault, and James P Evans*

110 **Timing of Earthquakes during the past 800 years along the Peninsula Section of the San Andreas Fault Suggests Persistent 1906-like Behavior,** *Gordon G Seitz, Maxime Mareschal, Nathan Barrett, and David Olsen*

111 **Hematite nano- to micro-textures and (U-Th)/He thermochronometry inform seismic and aseismic fault damage zone processes,** *Alexis K Ault, Robert G McDermott, Amy C Moser, and James P Evans*

112 **Frictional strengths of fault gouge from a creeping segment of the Bartlett Springs Fault, northern California,** *Jerlyn L Swiatlowski, Diane Moore, and David A Lockner*

113 **Testing the shorter and variable recurrence interval hypothesis along the Cholame segment of the San Andreas Fault,** *Alana M Williams, Ramon Arrowsmith, Thomas K Rockwell, Lisa Grant Ludwig, Sinan O Akciz, and Allen M Gontz*

114 **The rock record of seimic nucleation: a case study from the Whipple Mountains Detachment Fault, eastern California,** *Daniel Ortega-Arroyo, Whitney M Behr, and Emilie Gentry*

115 **San Andreas Fault Characterization at the LADWP Elizabeth Tunnel,** *Scott C Lindvall, Scott Kerwin, James P Evans, Jeffrey Tyson, James Chestnut, Chris Heron, Kevin Mass, Katherine M Scharer, Devin McPhillips, Diane Moore, Michael Farr, Christopher Ballard, Randolph T Williams, Kelly K Bradbury, Christie D Rowe, and Heather M Savage*

116 **Comparison of fault rocks formed paleoseismically and by paleocreep(?): Initial results from the West Salton detachment fault, southern California,** *Gary Axen, Katrina Soundy, and Virgil Leuth*

117 **Geomorphic and geologic evidence for slip along the San Bernardino strand of the San Andreas Fault System through the San Gorgonio Pass structural knot, southern California,** *Katherine J Kendrick, and Jonathan C Matti*

118 **Evidence of Na- and Mg-rich Hydrothermal Brines Driving Chloritization and Albitization in an Active Fault Zone: Case Study of the Borrego Fault, Baja CA, Mexico,** *Matthew T Dorsey, Thomas K Rockwell, Gary H Girty, Giles Ostermeijer, Thomas M Mitchell, and John M Fletcher*

119 **A new, 170 ka slip rate estimate on the Sierra Madre Fault,** *Nathaniel Lifton*

120 **Investigating strain transfer along the Southern San Andreas Fault: A geomorphic and geodetic study of block rotation in the Eastern Transverse Ranges, Joshua Tree National Park, CA,** *Katherine A Guns, Richard A Bennett, and Kimberly D Blisniuk*

121 **Slip rate variation of the Central Sierra Madre fault, southern California over the past 200 ka,** *Katherine M Scharer, Reed J Burgette, Austin Hanson, Nathaniel Lifton, Tammy M Rittenour, and Devin McPhillips*

122 **Sources and Magnitudes of Uncertainty in Fault Slip Rate, Cucamonga Thrust Fault, Southern California,** *Devin McPhillips, and Katherine M Scharer*

123 **Structural Architecture of the Western Transverse Ranges and Potential for Large Earthquakes – Trishear Forward Models,** *Yuval Levy, Thomas K Rockwell, John H Shaw, Andreas Plesch, Neal W Driscoll, and Hector Perea*

124 **Strath terraces in the Santa Ynez Valley suggest late Quaternary activity on a detachment fault beneath the Western Transverse Ranges, California,** *Nate W Onderdonk, Andrew Farris, Edward Tyler, Ani M Pytlewski, Antonio Garcia, and Shannon A Mahan*

125 **New high-resolution seismic data reveals the Holocene active structures and deformation events in offshore Ventura basin, CA,** *Hector Perea, Gülsen Ucarkus, Neal W Driscoll, Graham M Kent, Yuval Levy, and Thomas K Rockwell*

126 **Evidence for Holocene coseismic subsidence during a non- plate boundary earthquake,** *Laura C Reynolds, Alexander R Simms, Thomas K Rockwell, Yusuke Yokoyama, Yosuke Miyairi, and Alexandra Hangsterfer*

127 **A new estimate of latest Quaternary slip on the offshore Anacapa-Dume Fault at Sycamore Knoll, Southern California Continental Borderland,** *Ethan F Williams, Christopher M Castillo, Simon L Klemperer, Nicole Raineault, and Lind S Gee*

128 **Activity and earthquake potential of the Wilmington blind thrust, Los Angeles, CA: The largest earthquake source not on current southern California hazard maps?** *Franklin D Wolfe, James F Dolan, Andreas Plesch, and John H Shaw*

129 **Can maximum magnitude be derived from fault dimensions?** *Debbie Weiser, Natanya B Porto, and David D Jackson*

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312 **2017 UseIT: High Performance Computing Team,** *Sarah A Troise, Morgan T Bent, Robert A Hernandez, Rafael G Cervantes, Jeffrey Hermosura, Matthew D Martinez, Scott Callaghan, Jacquelyn J Gilchrist, Jozi K Pearson, Gabriela R Noriega, and Thomas H Jordan*

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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** John Shaw	**Texas A&M** Patrick Fulton	**UC Santa Barbara** Toshiro Tanimoto	**USGS Menlo Park** R. Harris, S. Hickman
Caltech Jean-Phillippe Avouac	**MIT** Tom Herring	**UC Los Angeles** Peter Bird	**UC Santa Cruz** Emily Brodsky	**USGS Pasadena** Rob Graves
CGS Tim Dawson	**SDSU** Tom Rockwell	**UC Riverside** David Oglesby	**UNR** Graham Kent	
Columbia Bruce Shaw	**Stanford** Paul Segall	**UC San Diego** Yuri Fialko	**USGS Golden** Nico Luco	

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.

Domestic Participating Institutions and Representatives

AECOM Paul Somerville	**CSU Sacramento** Steve Skinner	**Marquette U** Ting Lin	**U Alaska Fairbanks** Carl Tape	**U New Hampshire** Margaret Boettcher
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Arizona State J Ramon Arrowsmith	**Carnegie Mellon** Jacobo Bielak	**Penn State** Eric Kirby	**UC Davis** Michael Oskin	**U Texas El Paso** Bridget Smith-Konter
Boston University Christine Regalla	**Colorado Sch. Mines** Edwin Nissen	**Portland State** Brittany Erickson	**UC Irvine** Lisa Grant Ludwig	**U Texas Austin** Whitney Behr
Brown Terry Tullis	**Cornell** Rowena Lohman	**Purdue** Andrew Freed	**U Cincinnati** Lewis Owen	**U Wisconsin Madison** Clifford Thurber
CalPoly Pomona Jascha Polet	**Georgia Tech** Zhigang Peng	**Smith** John Loveless	**U Illinois** Karin Dahmen	**Utah State** Susanne Janecke
CSU Fullerton Dave Bowman	**Indiana** Kaj Johnson	**SMU** M. Beatrice Magnani	**U Kentucky** Sean Bemis	**Utah Valley** Nathan Toke
CSU Long Beach Nate Onderdonk	**JPL** Andrea Donnellan	**SUNY at Stony Brook** William Holt	**U Massachusetts** Michele Cooke	**WHOI** Jeff McGuire
CSU Northridge Doug Yule	**LLNL** Arben Pitarka	**Tufts** Robert Viesca	**U Michigan Ann Arbor** Eric Hetland	

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 Canterbury (New Zealand)** Brendon Bradley
CICESE (Mexico)	**ETH Zürich (Switzerland)**	**Nat'l Taiwan U (Taiwan)**	**U Otago (New Zealand)** Mark Stirling
DPRI Kyoto (Japan)	**GNS (New Zealand)**	**U Bristol (United Kingdom)** Max Werner	**Western Univ (Canada)**

Apply as a Participating Institution

E-mail the application to scec@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 must be approved by a majority vote of the SCEC Board of Directors.

HILTON PALM SPRING RESORT

400 East Tahquitz Canyon Way
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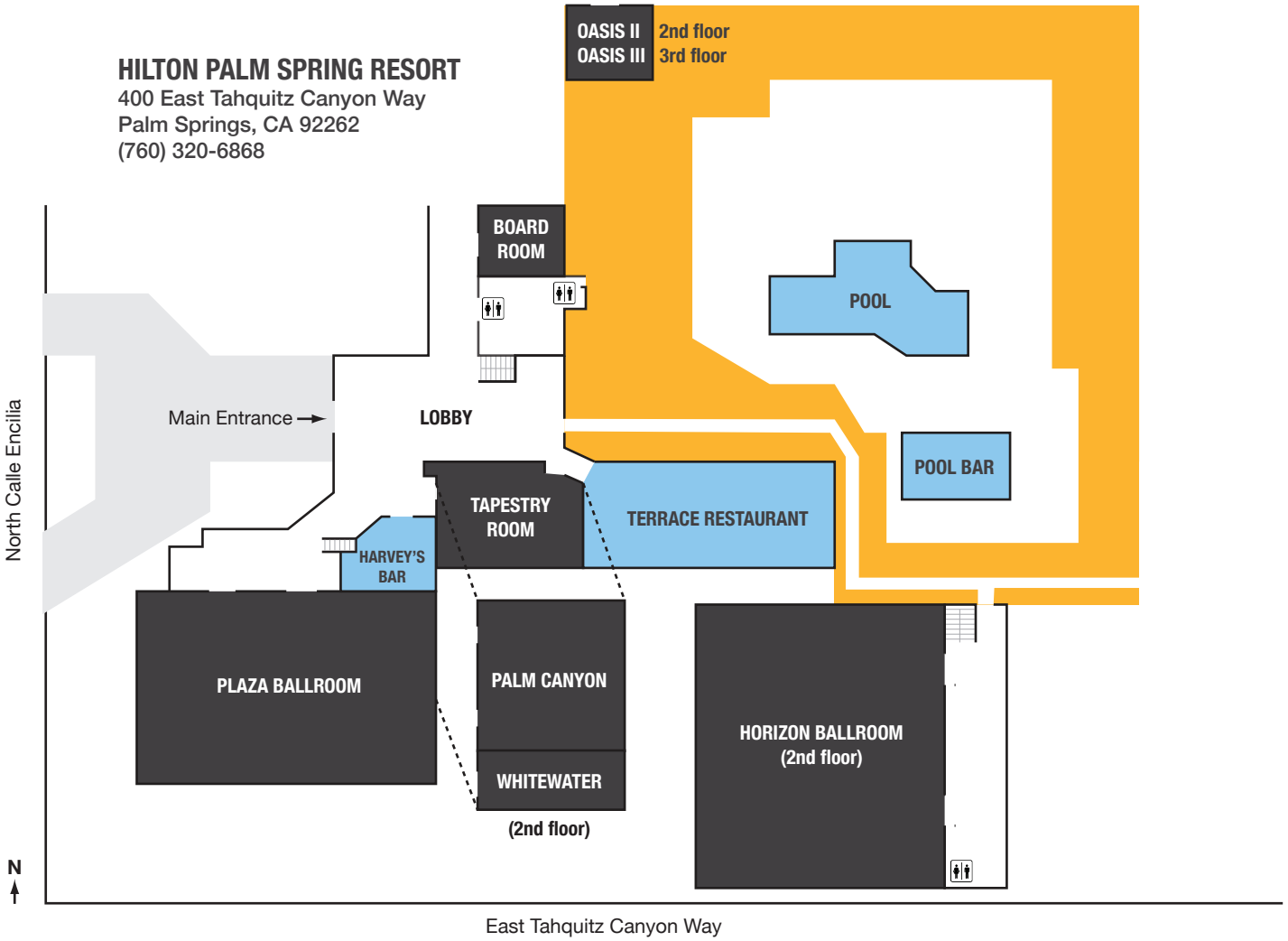
(760) 320-6868



SATURDAY, September 9

09:00-17:00 Workshop: SCEC Community Rheology Model (Plaza AB)
09:00-17:00 Workshop: Nonlinear Shallow Crust Effects (Plaza C)
09:00-17:00 Workshop: Informing Earthquake Debates with CSEP (Plaza D)

SUNDAY, September 10

09:00-12:30 SCEC Special Projects Planning Meeting (Palm Canyon)
12:00-17:00 Registration and Check-In (Lobby)
13:00-17:00 Workshop: Updating CFM for Earthquake Simulators (Oasis III)
13:30-17:00 Public Communications Theory and Practice for Scientists (Palms Canyon)
15:00-20:00 Poster Set-Up (Plaza)
17:00-18:00 Annual Meeting Welcome Social (Lobby, Harvey's, Plaza)
18:00-19:00 Distinguished Speaker Presentation (Horizon)
19:00-20:30 Welcome Dinner (Poolside)
19:00-21:00 SCEC Advisory Council Dinner Meeting (Palm Canyon)
21:00-22:30 Poster Session (Plaza)

MONDAY, September 11

07:00-08:00 Registration and Check-In (Lobby)
07:00-08:00 Breakfast (Poolside)
07:00-08:00 SCEC Transitions Program Student Breakfast (Tapestry)
08:00-09:40 Session 1: The State of SCEC (Horizon)
10:00-11:00 Session 2: The Case for SCEC (Horizon)
11:00-12:30 Session 3: Physics-Based Seismic Hazard Analysis (Horizon)
12:00-17:00 Registration and Check-In (Lobby)
12:30-13:30 Lunch (Restaurant, Tapestry, Poolside)
13:30-15:00 Session 4: CSEP and Operaional Earthquake Forecasting (Horizon)

MONDAY, September 11 (continued)

15:00-17:00 Poster Session (Plaza)
15:00-18:00 Leadership Meeting: SCEC CEO Planning Commitee (Oasis II)
19:00-22:00 SCEC Honors Banquet (Hard Rock Hotel Ballroom)

TUESDAY, September 13

07:00-08:00 Breakfast (Poolside)
07:00-08:00 SCEC Transitions Program Student Breakfast (Tapestry)
08:00-10:00 Session 5: The Future of SCEC (Horizon)
10:30-12:00 Session 6: Earthquake Gates Area Initiative (Horizon)
12:00-13:30 Lunch (Restaurant, Tapestry, Poolside)
13:30-15:00 Session 7: SCEC Community Models (Horizon)
15:00-17:30 Poster Session (Plaza)
17:30-21:00 *Free Time*
21:00-22:30 Poster Session (Plaza)

WEDNESDAY, September 14

07:00-08:00 Breakfast (Poolside)
08:00-08:30 SCEC Advisory Council Report (Horizon)
08:30-10:00 Session 8: From Hazard to Risk (Horizon)
10:00-10:15 Demonstration of Temblor (Horizon)
10:30-12:00 Session 9: Post-Earthquake Response (Horizon)
12:00-12:15 Director's Closing Remarks (Horizon)
12:15 Adjourn 2016 SCEC Annual Meeting

12:30-14:30 SCEC PC Lunch Meeting (Palm Canyon)
12:00-14:00 SCEC Board Lunch Meeting (Tapestry)