# *SCEC Advisory Council Recommendations*

*Palm Springs, California*

*10 September 2014*

**Gail Atkinson, AC Chair**

**Western University, London ON**

# SCEC Advisory Council Membership

- **Gail Atkinson, Chair (***Western University***)**
  - **Email: gmatkinson@aol.com**
- **Norm Abrahamson (***Pacific Gas and Electric***)**
- **Roger Bilham (***University of Colorado)*
- **Donna Eberhart-Phillips** (*UC Davis*)
- **Kate Long (***California Office of Emergency Services***)**
- **Warner Marzocchi (***INGV, Rome***)**
- **M. Meghan Miller** (*UNAVCO*)
- **Farzad Naeim (***John A. Martin and Associates – through Aug.2014***)**
- **Tim Sellnow (***University of Kentucky***)**
- **John Vidale (***University of Washington***)**
- **Andrew Whittaker** (*University of Buffalo*)

# AC overall impressions

- SCEC is unique: it is the pre-eminent organization in the world where a community of informed scientists are focused with razor sharp acuity on the physical issues of earthquake nucleation and propagation, and their impacts on society.
- Interdisciplinary strength and synergy: confluence of a stunning breadth of expertise.
- Cutting edge results: stimulating new ideas question many former assumptions in earthquake science. Some of these novel ideas will undoubtedly form the nucleus of future improvements in understanding earthquakes.
- SCEC approach to technology transfer has matured. This is a major SCEC4 accomplishment that provides a compelling rationale for support of SCEC5.

# 2014 Advisory Committee focus

- Changes in leadership structure
- Assessment of SCEC4 activities
- CEO Advisory Structure and Goals
- Major SCEC initiatives
- Annual meeting
- Plans for SCEC5

# Changes in SCEC leadership structure

- Proposed leadership plan effectively addresses the immediate challenges in finding a new SCEC director, and sets the stage for a successful leadership succession
- The AC welcomes the well-deserved appointment of the SCEC co-Director and co-PI, the Planning Committee Vice-Chair, and the addition of the USC-funded Executive Science Director – these are tangible and important changes that will enable SCEC5 and subsequently facilitate a successful search on an international level

# Highlights of Progress on SCEC4

**On target for successful completion of SCEC4. Notable areas of success this year:**

1. **Progress on understanding the role of plastic deformation in fault zones and their influence on ground motions – implications for source models noted**
2. **Role of San Gorgonio Pass in segmenting large Southern California earthquakes on San Andreas growing clearer**
3. **Retrospective CSEP experiment on Canterbury sequence shows better performance for physics-based model (vs. statistical model).**
4. **Seismology-engineering interface is moving physics-based methods closer to implementation.**
5. **Attention to several timescales in UCERF3; providing useful foundation for both long-term forecasts of fault behavior and operational earthquake forecasts**
6. **ShakeOut and flagship CEO program have major national and international influence**

# CEO Advisory Structure and Goals

- Associate Director Mark Benthien has developed a sound plan for CEO structure; will facilitate this critical and highly-successful area of activity
- CEO planning committee to be formed, with teleconferences every few months. Focus on activities and goals on a regular basis; makes it feasible and attractive for stakeholders to participate
- Two members of AC (Long and Sellnow) will sit in on the teleconferences of this committee and offer advice as requested (also report back to AC).
- CEO planning committee will evaluate CEO activities of SCEC4, and advise on integration of CEO activities throughout the projects of SCEC5.

# Major SCEC initiatives

**(outside the core program)**

- **These are recognized as critical and appropriate – they align with SCEC priorities**
- **HPC – ongoing success; parallel development of hardware and software through co-design center ambitious plan**
- **Central California experiment – good model of mission-aligned science/industry partnership**
- **Earthquake forecasting (CISM) – extending concepts of CSEP – important to operational earthquake forecasting; need to clarify roles of partners in implementation**

# Annual meeting format

- Pre-meeting workshops well-attended and effective.
- Good to have only one talk at a time during the main meeting – leads to a common experience among attendees.
- But its sometimes hard for early career scientists to participate during big session.
- Perhaps too large an audience for effective interaction and engagement.
- Questions for SCEC to consider:
  - How to balance size of meeting and inclusiveness?
  - How to highlight science communication even more effectively

# Plan for SCEC5 – SCEC5 themes

**Overall – words are important: choose them carefully in titling themes**

## A –Quantifying aleatory and epistemic uncertainty

- **Electrifying plenary by Norm Abrahamson set the tone for discussions, showing how uncertainties in hazard estimation lead to huge uncertainties in assessment of risk.**
- **A testing protocol is important to establish to what extent uncertainty is actually reduced by the addition of modeling detail and complexity – 'the more detailed the model the better' may not apply**
- **Wide range of science components where uncertainty may be reduced – need to focus on those that have most significance (e.g. ground motion modeling)**
- **Reduction of epistemic uncertainties will require WAY more high quality data – how can SCEC encourage more data collection?**

# Plan for SCEC5 – SCEC5 themes

- **B – what properties of earth/faults are important to understand system behavior:**
  - **Go beyond backslip – Investigate alternative mechanisms to load S. Calif faults – role of viscoelasticity, fluids, heat flow, geothermal gradient.**
  - **Is the next step a Community Rheology Model? (CRM)**
  - **Non- planar fault structure;  both geology and modelling are showing significant off-fault deformation.**

# Plan for SCEC5 – SCEC5 themes

- **C – Using simulated earthquake motions to better assess hazard and risk in the real world**
  - this theme is aimed at reducing uncertainty in hazard assessment (not risk)
  - Need a well-documented and reproduceable hazard assessment process to be useful in engineering (e.g. broadband platform a good example of prospective approach to evaluating model performance)
  - Management of simulation products an important issue –need to be available in a useable form for engineering applications
  - Establishing the link between hazard estimates and felt or building observations a promising area (rocks, bells, chimneys, DYFI)

# Plan for SCEC5 – SCEC5 themes

- D – To what extent is earthquake behavior predictable?
  - Induced seismicity affords new opportunities; physical mechanisms are still poorly understood
    - Fluid injection, fracking, tides, reservoirs
  - What data do we require to understand the processes?
  - Are there differences between anthropogenic and other earthquakes?
    - Stress drop, clustering, complexity

# Plan for SCEC5 – SCEC5 themes

- **E – Preparing for and responding to future earthquakes**

  **EEW research will be furthered by SCEC contributions in**

  – **Earthquake statistics and Bayesian analysis**
  – **Recognizing large earthquakes from early observations**
  – **Merging geodetic and ground motion signal information**
  – **Public education around how to respond to EEW messages**
  – **Tracking performance of EEW (by CSEP)**

  **Earthquake response**

  – **Bringing together the players and emerging data; clearinghouse role**
  – **Identify crucial transient effects that may be important to characterizing earthquake process**

# Plan for SCEC5 – SCEC5 themes

- **F – How can we communicate more effectively what we know and what we don't?**

**- SCEC needs to identify its audience. Establish relevance for that audience and communicate on a level commensurate with their science literacy.**

**- Communicating what is known should ultimately be expressed in terms of the contributions SCEC can make toward informing those at risk of how they can take meaningful action to protect themselves.**

**- Communicating what is unknown should be expressed as part of an ongoing effort to reduce uncertainty. Expressing the unknown precludes unrealistic expectations.**

# Thanks to the entire SCEC team for another great meeting!

**See you next year**