NGA-East SSHAC Workshop 3C Introduction

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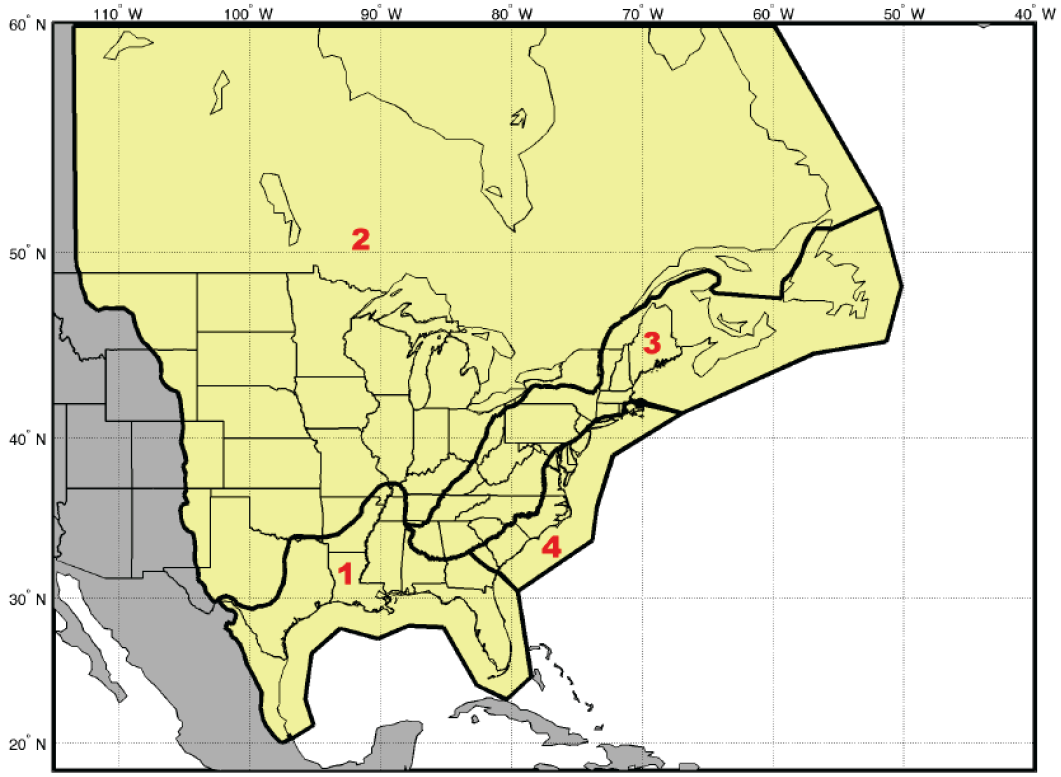
Input to Seismic Hazard Analyses (SHA)

- Deterministic and Probabilistic SHA requires two main pieces:
  - Seismic Source Characterization (CEUS SSC)
  - Ground Motion Characterization (NGA-East GMC)



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The NGA-East Project

A science/development phase

AND a SSHAC Level 3 project

Objective – to develop GMC model:

- Ground-Motion Models (GMMs)/GMPEs
  - Median
  - Standard Deviation "Sigma" (aleatory variability)
- Logic trees (epistemic uncertainty)
- For:
  - Average horizontal ground motions (5%-damped PSA for f=0.1-100Hz), for
  - Hard rock sites (V_S=3000 m/s, κ=0.006 s) located up to 1,200 km from
  - Future earthquakes in CENA **M**4.0-8.2

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Critical Issues and Approach

- Hazard-critical issues:
  - Regionalization of source and path parameters
  - Geometrical spreading in first 40 km
  - Stress drop (or parameter) and extrapolation of ground motions to large **M**
  - Standard deviation of ground motions
  - Quantification of site effects
- Solution:
  - 1) run a multi-disciplinary science project with working groups focused on specific research tasks
  - 2) build models making extensive use of seismological constraints (simulations)
  - 3) perform the evaluation and integration under the SSHAC Level 3 umbrella

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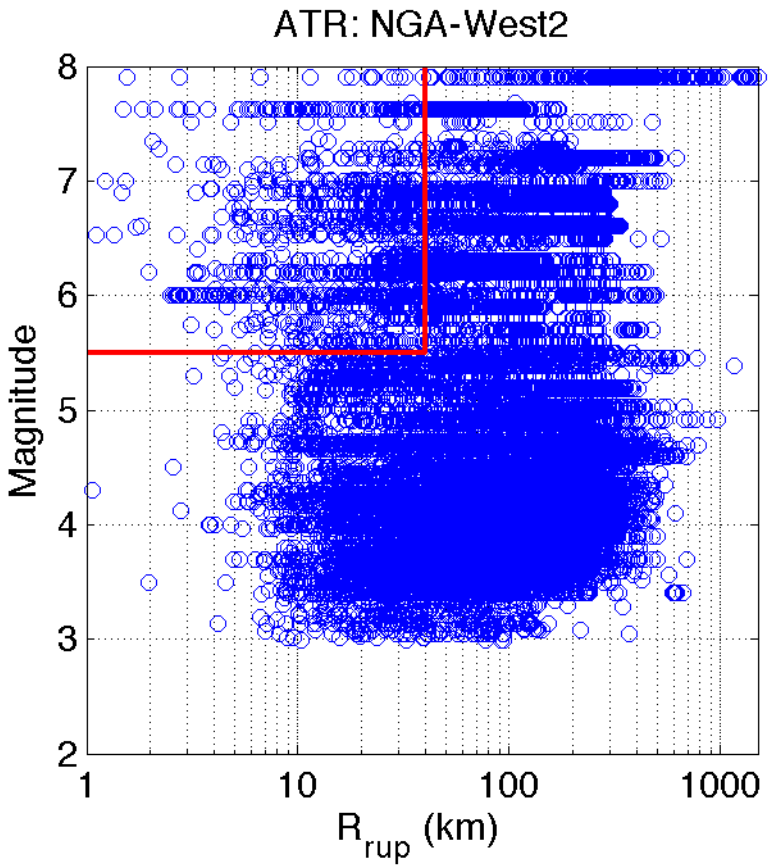
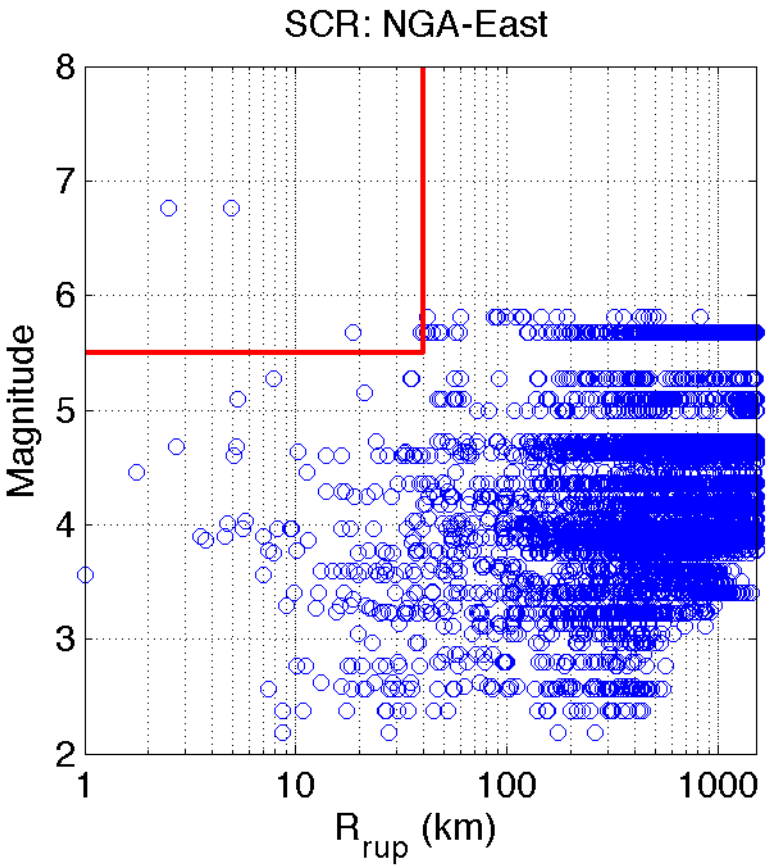
NGA-East – a hybrid project

- Multi-disciplinary **science** project with working groups focused on specific research tasks

- **SSHAC** Level 3 project for evaluation and integration of ground-motion models

The NGA-East Challenge: developing GMC model with limited data





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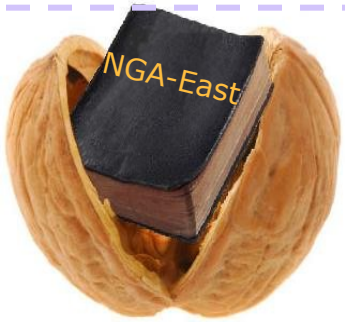


L. Logic Trees

I. Test of GMPEs

J. Standard Deviation (Sigma)

H. Median GMMs

K. Epistemic Uncertainty of GMMs

G. Stochastic Simulations

D. Source/Path Studies

C. Regionalization

F. Stochastic Simulation Methods

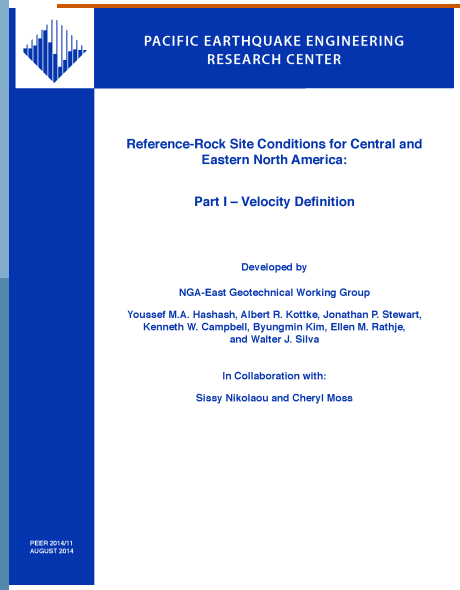
E. Finite-Fault Simulations

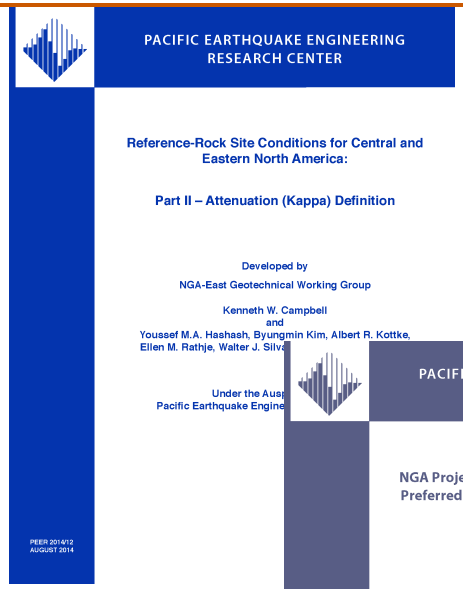
B. Reference Rock

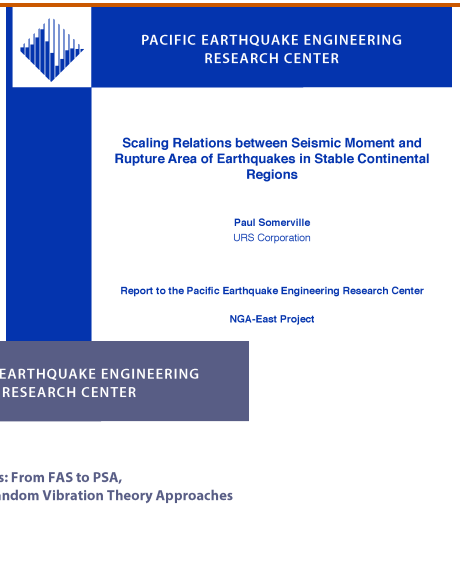
A. Recorded Data Sets

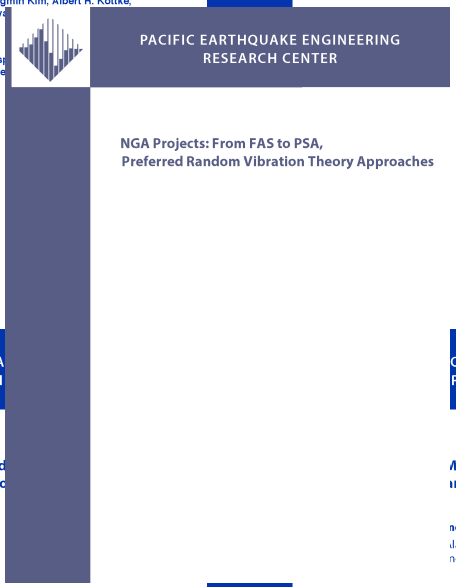
M. Hazard Feedback Analyses

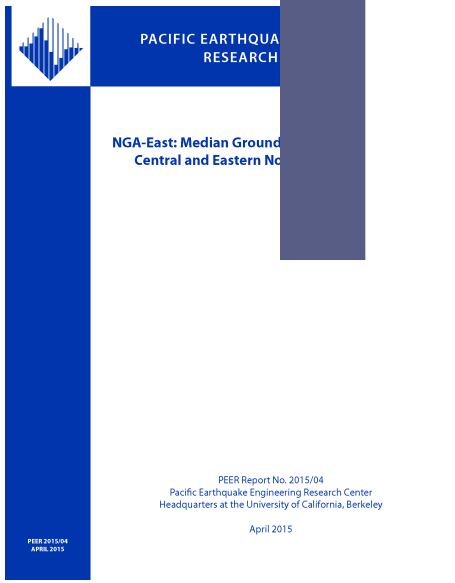
NGA-East Science: PEER Reports

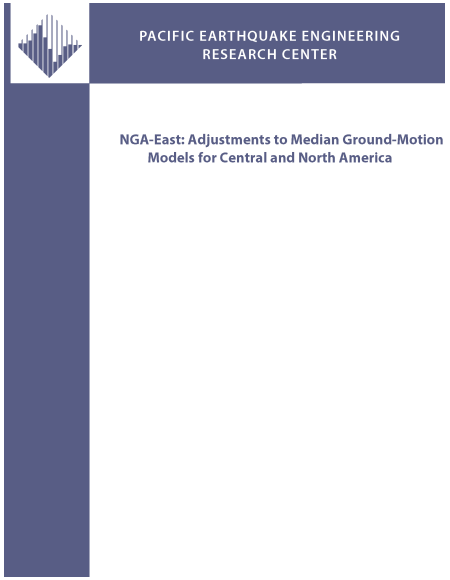












Progress Since March Workshop

- Refined median GMMs
- Finalized "sigma" models
- Assigned weights to median and sigma models
- Developed models for Gulf Coast
- Developed a model for source-depth effects
- Documentation and data dissemination
  - NGA-East GMM report published 2015/04
  - NGA-East Sigma report published 2015/07
  - NGA-East GMM Adjustment report 90% draft
  - SHHAC report: draft in progress

What is SSHAC?

- A set of **procedural guidelines** for seismic hazard analyses
- Procedures defined by the **S**enior **S**eismic **H**azard **A**nalysis **C**ommittee (SSHAC)
- Implementation in constant evolution
- Level qualifies complexity (1-4)
- NGA-East is a SSHAC Level 3 project
- Details in SSHAC NUREG/CR-6372 and NUREG-2117

See PEER NGA-East page for link to these documents:

http://peer.berkeley.edu/ngaeast/

Goals of SSHAC process

To carry out properly and document completely the activities of evaluation and integration

- **Evaluation**: The consideration of the complete set of data, models, and methods proposed by the larger technical community that are relevant to the hazard analysis.

- **Integration**: Representing the center, body, and range of technically defensible interpretations in light of the evaluation process (**CBR of the TDIs**).

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Other Key Features of SSHAC process

- Clearly defined **roles** for all participants.
- Structured interactions among participants, including technical challenge of positions, in **formal workshops** (themes 1-3).
- **Rigorous peer review** of the entire process and **thorough documentation.**

SSHAC Workshop theme 3: Feedback

- Goals
  - To present and discuss the preliminary GMC model
  - To ensure that no significant issues have been overlooked (discussions and PPRP feedback)
  - To provide hazard-informed focus on finalizing the model (hazard feedback)
- Key participants
  - **Technical Integration Team**: Norm Abrahamson, Christine Goulet, Linda Al Atik, Gail Atkinson, Rob Graves, Bob Youngs
  - **Participatory Peer Review Panel**: Gabriel Toro, John Adams, Jon Ake, John Ebel, Jeff Kimball, Rich Lee
  - **Proponent and Resource Experts**

This is a formal SSHAC workshop!

- presenters show results from **collective work**
- interactions are structured: only **Resource** and **Proponent Experts** can participate in the discussions
  - see Norm or Christine at breaks if you have a key issue to bring up and are not a RE or PE
- members of public can attend workshop as **Observers**
- comments from Observers are made possible at the **end of the day,** as time allows
- comments on workshop issues can be provided in writing: goulet and abrahamson @berkeley.edu
- recorded, to be posted as part of the SSHAC documentation
  - Use the microphone
  - Use the ReadyTalk chat window to contact us

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Today's meeting

- In-person and web/phone attendees
- ALL participants on-site need to use the **microphones** and **announce their name**
- Remote attendees, "raise your hand" or use chat on ReadyTalk to send a question or send an e-mail to: sahar.der@berkeley.edu

- Agenda and additional info at
  - http://peer.berkeley.edu/ngaeast/events/

Agenda overview

- Day 1 Wednesday
  - Median Ground Motions
  - Standard deviation of ground motions
- Day 2 Thursday
  - Hazard feedback analyses
  - Adjustment to median models
    - Gulf Coast/Mississippi embayment region
    - Source-depth effects
  - Summary of everything...