Development of GMPEs for Central and Eastern North America: NGA-East Overview

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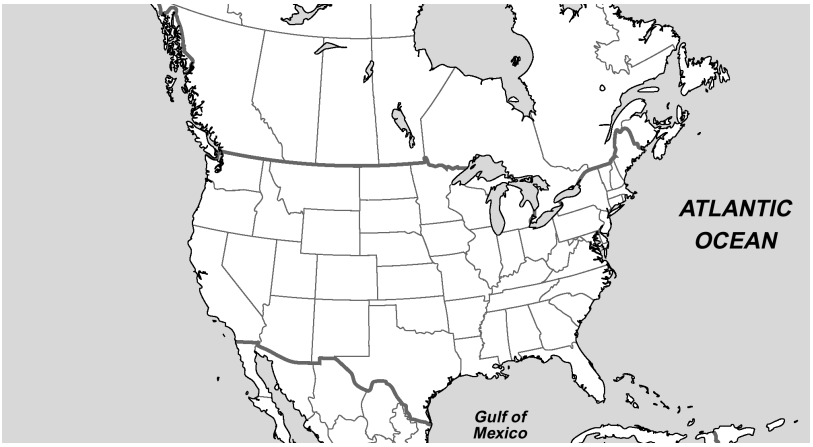
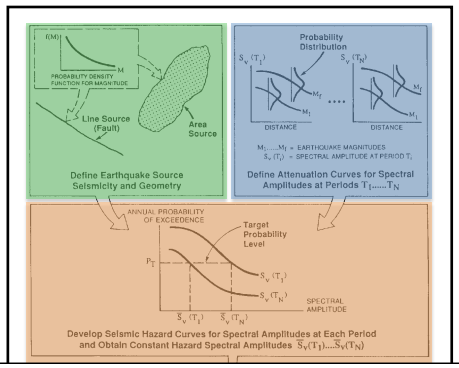
Central and Eastern North America



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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NGA-East

A science/development phase AND a SSHAC Level 3 project

Objective – to develop

- GMPEs
  - Median
  - Standard Deviation (aleatory variability)
- Logic tree (epistemic uncertainty)
- For:
  - Average horizontal ground motions (PGA, PGV and 5%-damped PSa for T=0.01-10s)
  - Hard rock sites located up to 1,000 km
  - Future earthquakes in CENA 4.0-8.2 Mw

What is SSHAC?

- It is a **procedural assessment** process for seismic hazard analyses
- Implementation in constant evolution
- Level qualifies complexity (1-4)
- NGA-East is a SSHAC Level 3 project
- Details in SSHAC NUREG/CR-6372 and summary in USGS OFR 2009-1093

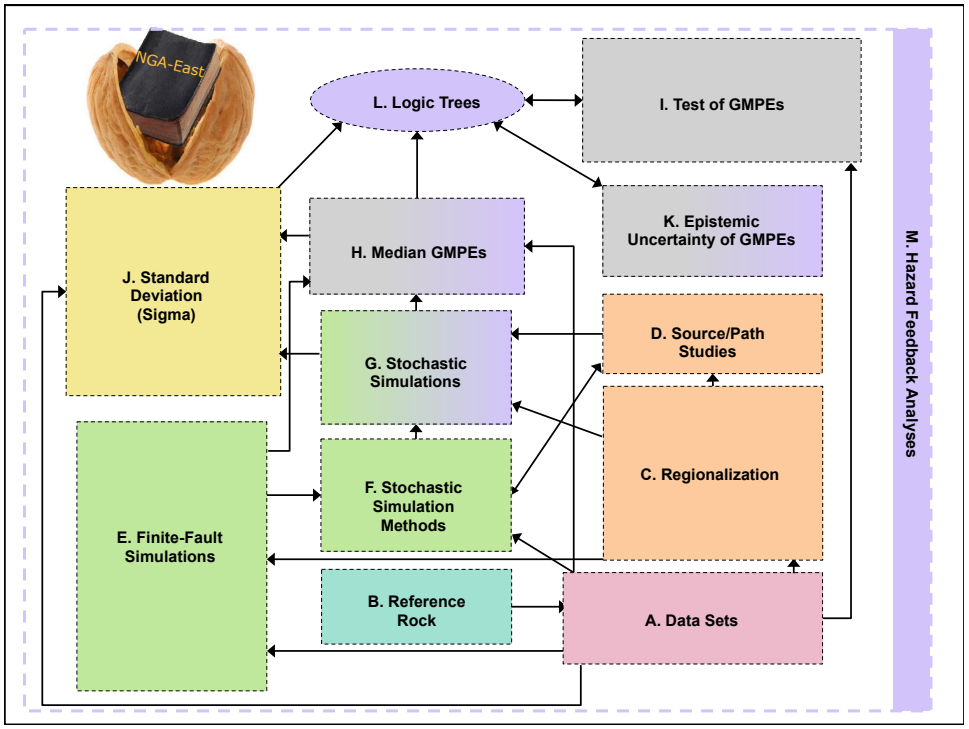
See NGA-East page for link to these documents:

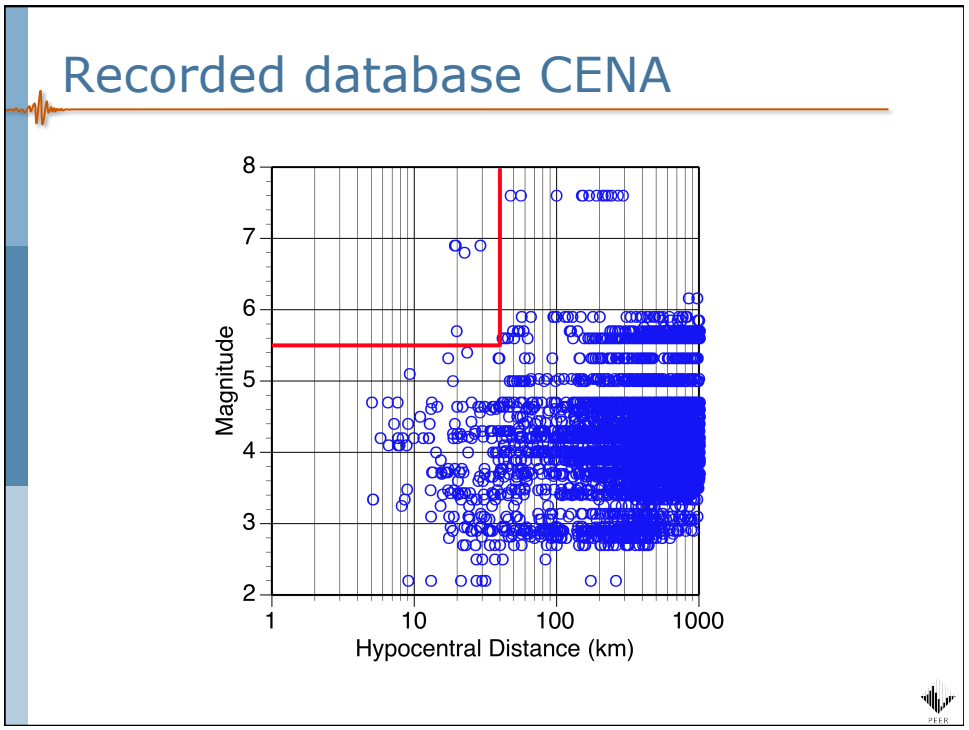
http://peer.berkeley.edu/ngaeast/

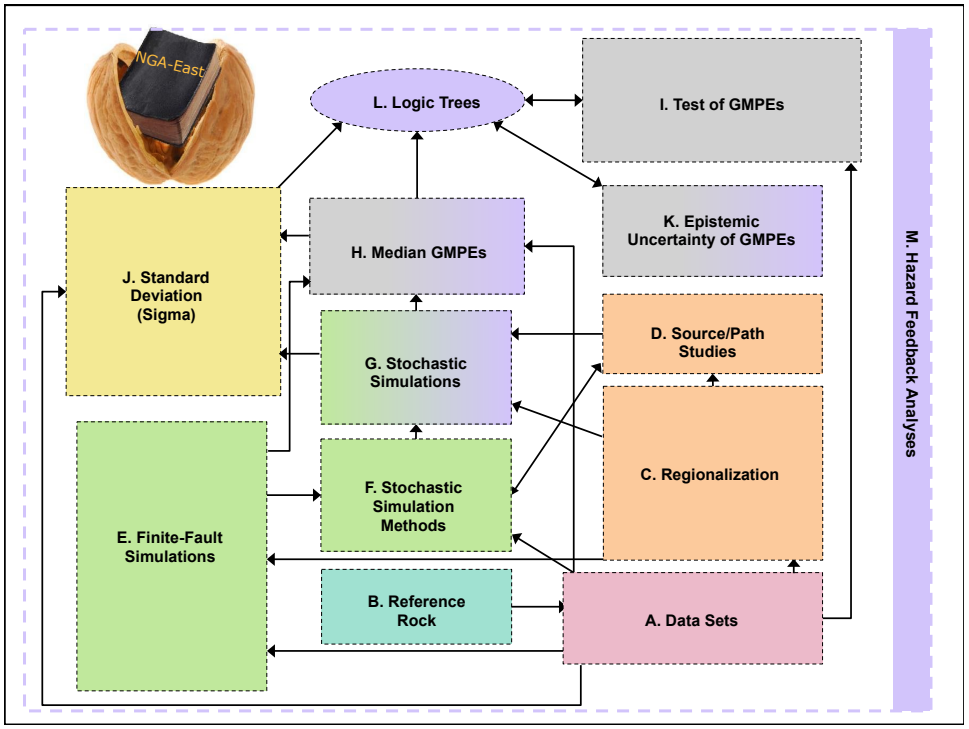
Objective of the SSHAC process

Capture the Center, Body and Range (CBR) of the Technically Defensible Interpretations (TDIs)

- Explicit objective not to **capture** just the views of participants but ultimately the **range of TDIs.**
- Comprehensive data collection and exposure of all participants to the **complete data set** and all available models.
- Clearly defined roles for all participants. Structured interactions among participants, including technical challenge of positions, in **formal workshops**.
- **Rigorous peer review** of the entire process and **thorough documentation.**


NGA-East
L. Logic Trees
I. Test of GMPEs
K. Epistemic Uncertainty of GMPEs
H. Median GMPEs
J. Standard Deviation (Sigma)
D. Source/Path Studies
G. Stochastic Simulations
C. Regionalization
F. Stochastic Simulation Methods
E. Finite-Fault Simulations
B. Reference Rock
A. Data Sets
M. Hazard Feedback Analyses


Recorded database CENA
Magnitude
Hypocentral Distance (km)
8
7
6
5
4
3
2
1
10
100
1000



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	Walt	Silva	Pacific Engineering, Inc.	pacificengineering@juno.com

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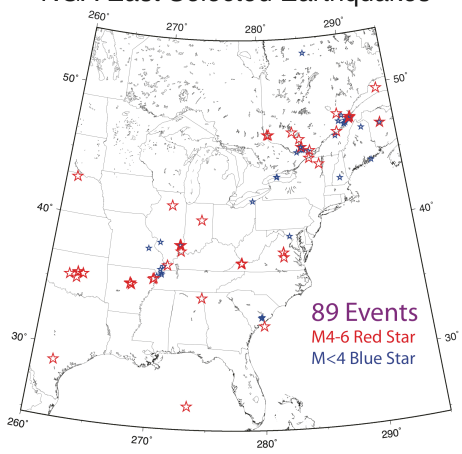
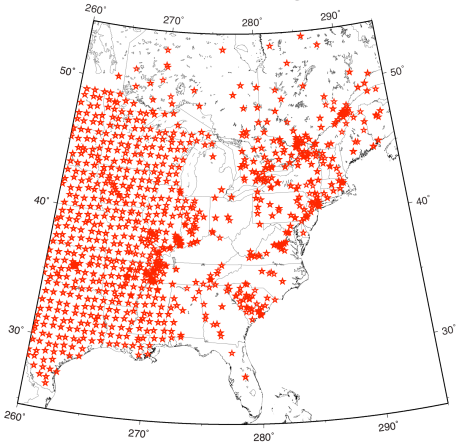
- A: CENA Database (Cramer)

NGA East Selected Earthquakes



NGA East Recording Stations



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- B: Reference rock conditions (Kottke)

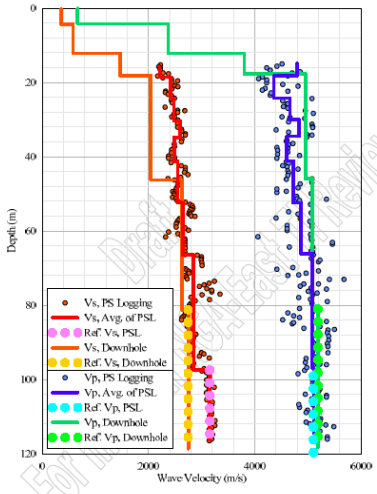

Figure 2: Wave velocities at Bell Bend NPP (FSAR Figure 2.5-151).

Source: Hashash *et al.*

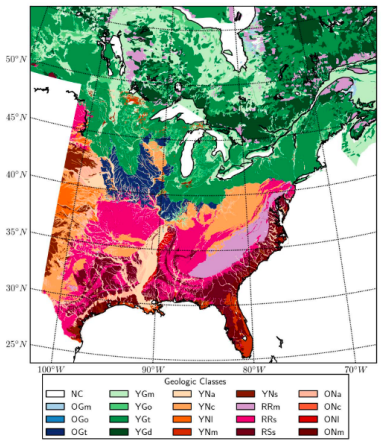

Figure 7. Map of the geologic classes as defined in Table 1: Old & Young Glacial Sediments (OGm, OGo, OGt, YGm, YGo, YGt, YGd); Old & Young Non-Glacial Sediments (ONa, ONc, ONl, ONm, YNa, YNc, YNl, YNm, YNs); and Residual Sediments (RRm, RRs, RSs).

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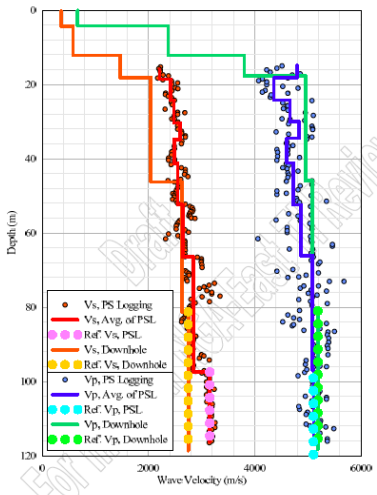

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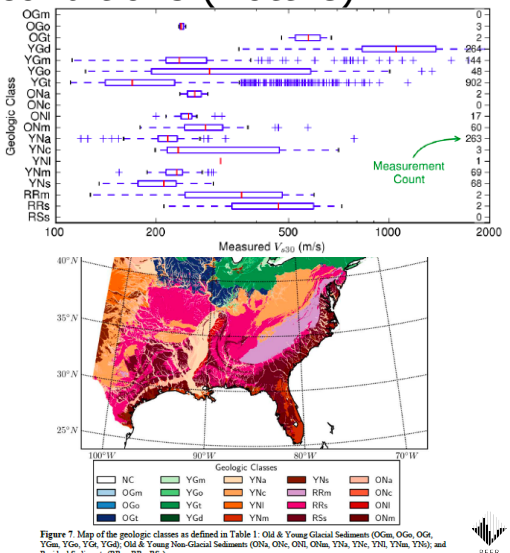

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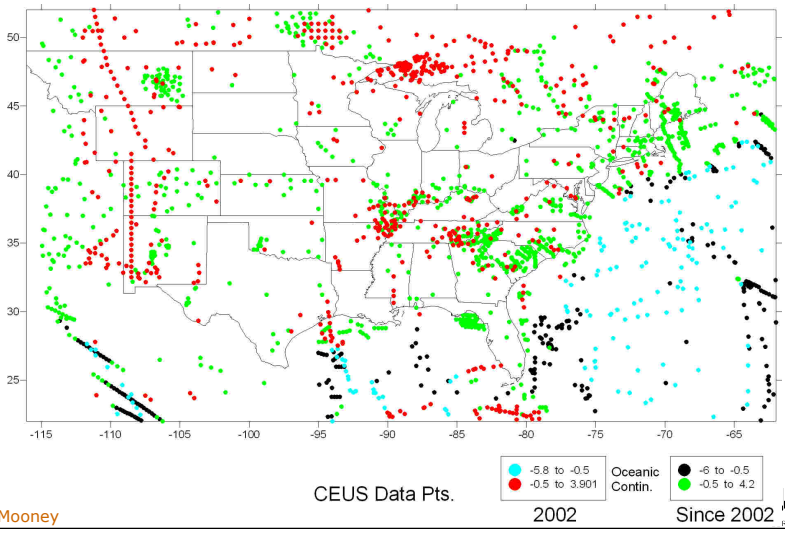
- C: Regionalization (Mooney)



14 Source: Walter Mooney

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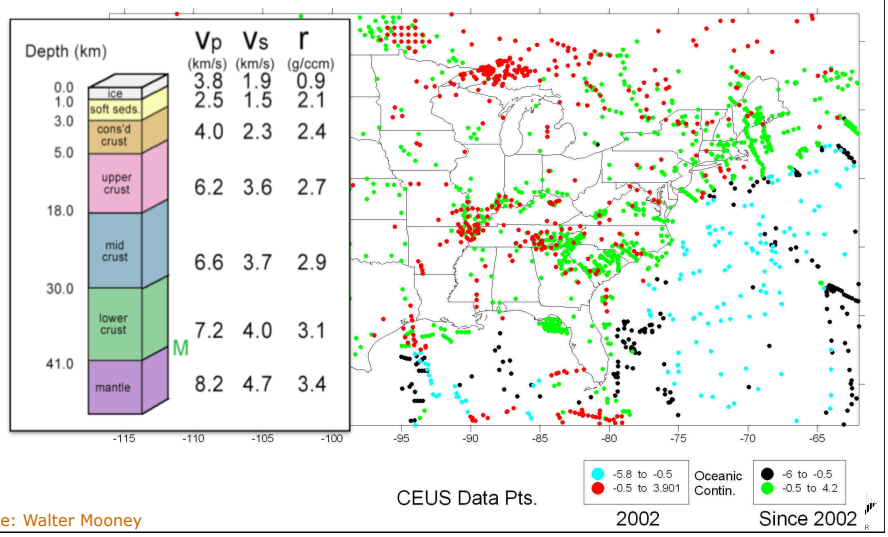
- C: Regionalization (Mooney)



15 Source: Walter Mooney

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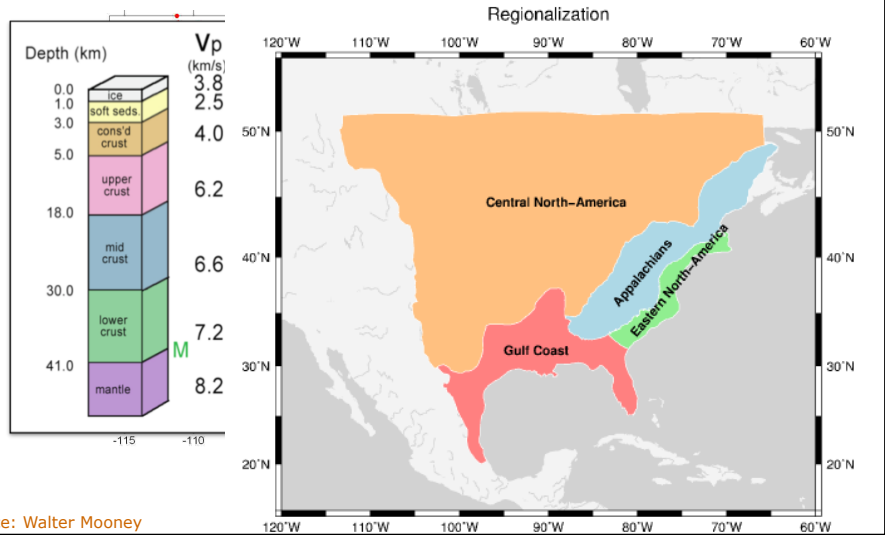
- C: Regionalization (Mooney)



16 Source: Walter Mooney

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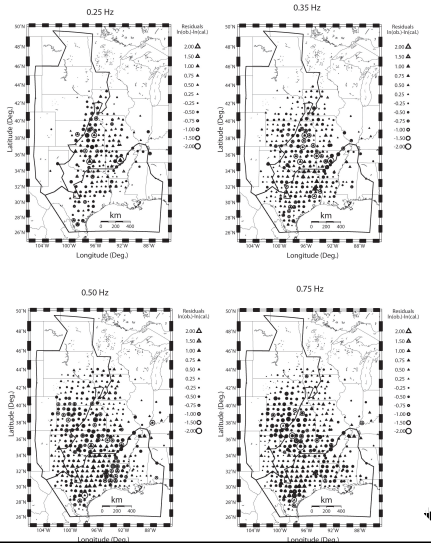
- C and D: Regionalization and Path/Source Studies (Chapman)
  - Regression residuals using the Transportable Array (TA) records



17 Source: Martin Chapman

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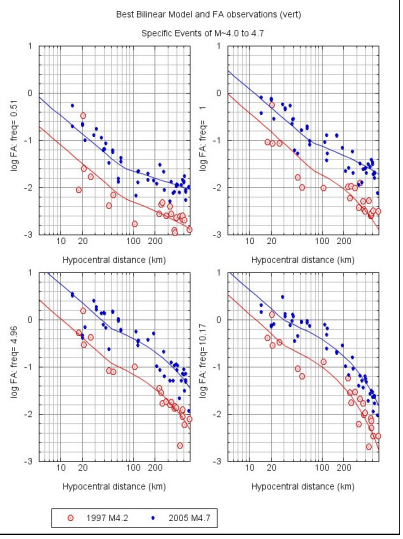
- D: Path/Source Studies (Graves)
  - Summary of various Path/Source models developed from recent CENA records



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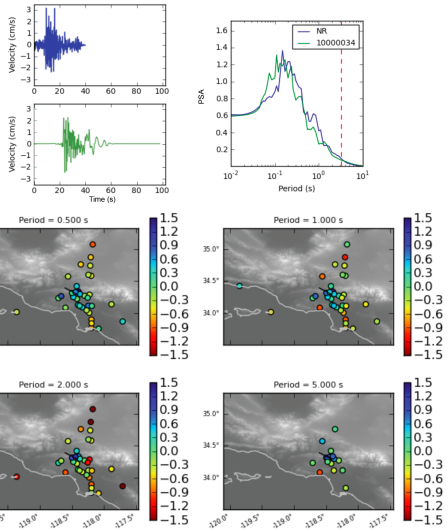
- E and F: Ground Motions Simulations (Goulet)
  - Summary of recent and ongoing validation of models



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- H: Development of Median GMPEs (Abrahamson)
  - A novel approach to GMPE development
- Key critical technical issues…

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And much more…

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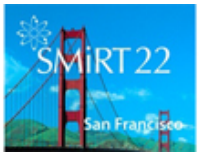
Thank you!



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