Improving Seismic Provisions in US Codes through Ground-Motion Simulations:

The Role SCEC Can Play

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SCEC

New Approach for Computing Long Period S_a

Use 3-D Numerical Models

Application: Urban Areas

Primary End Product

Long Period S_a Maps

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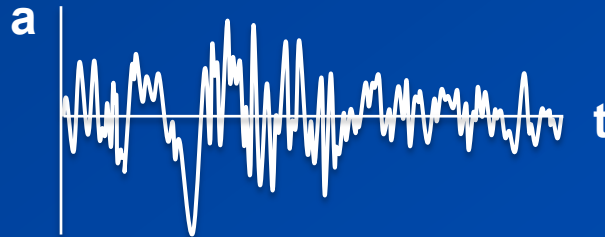**Next Generation Seismic Codes**

SC/EC

Recommendation to SCEC

- Conduct pilot study for L.A. Basin

- Objective – Generate Long-Period Ground-Motion Maps per PSHA/DSHA Procedures in Ch. 21, ASCE 7-10

- Substitute simulations for GMPEs

- Use SCEC CyberShake: $f \leq 1$ Hz ($T \geq 1$ sec)
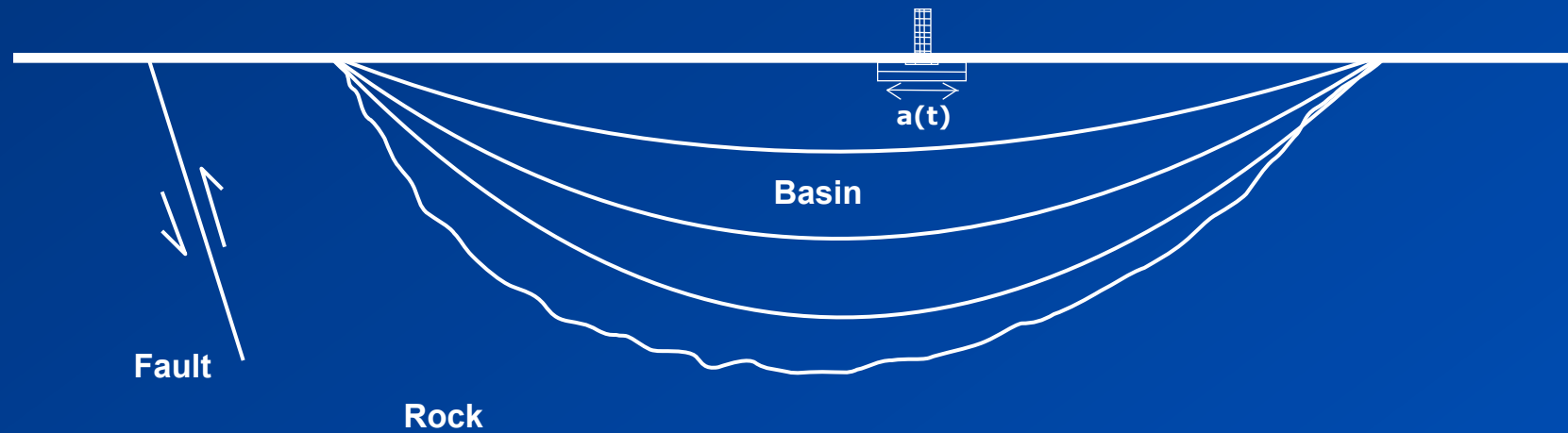
Secondary End Product
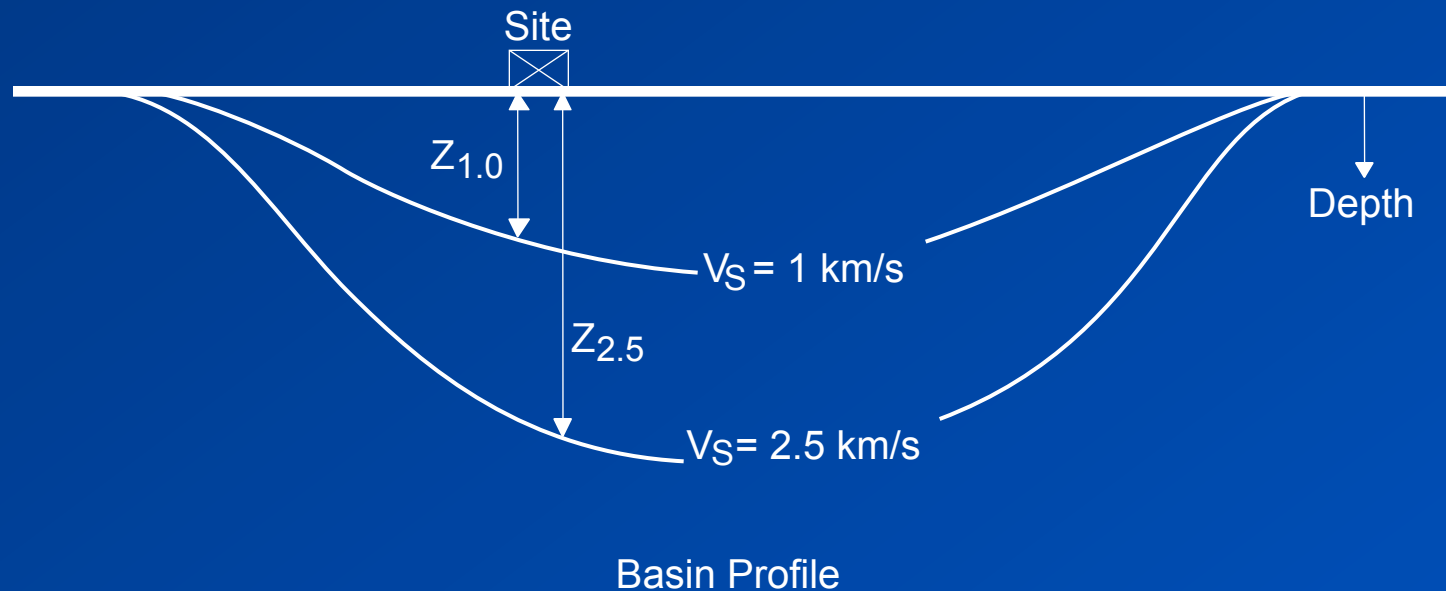## (Primary Output)

Simulated Time Histories

Model Regional 3-D Effects on Long Period Motions
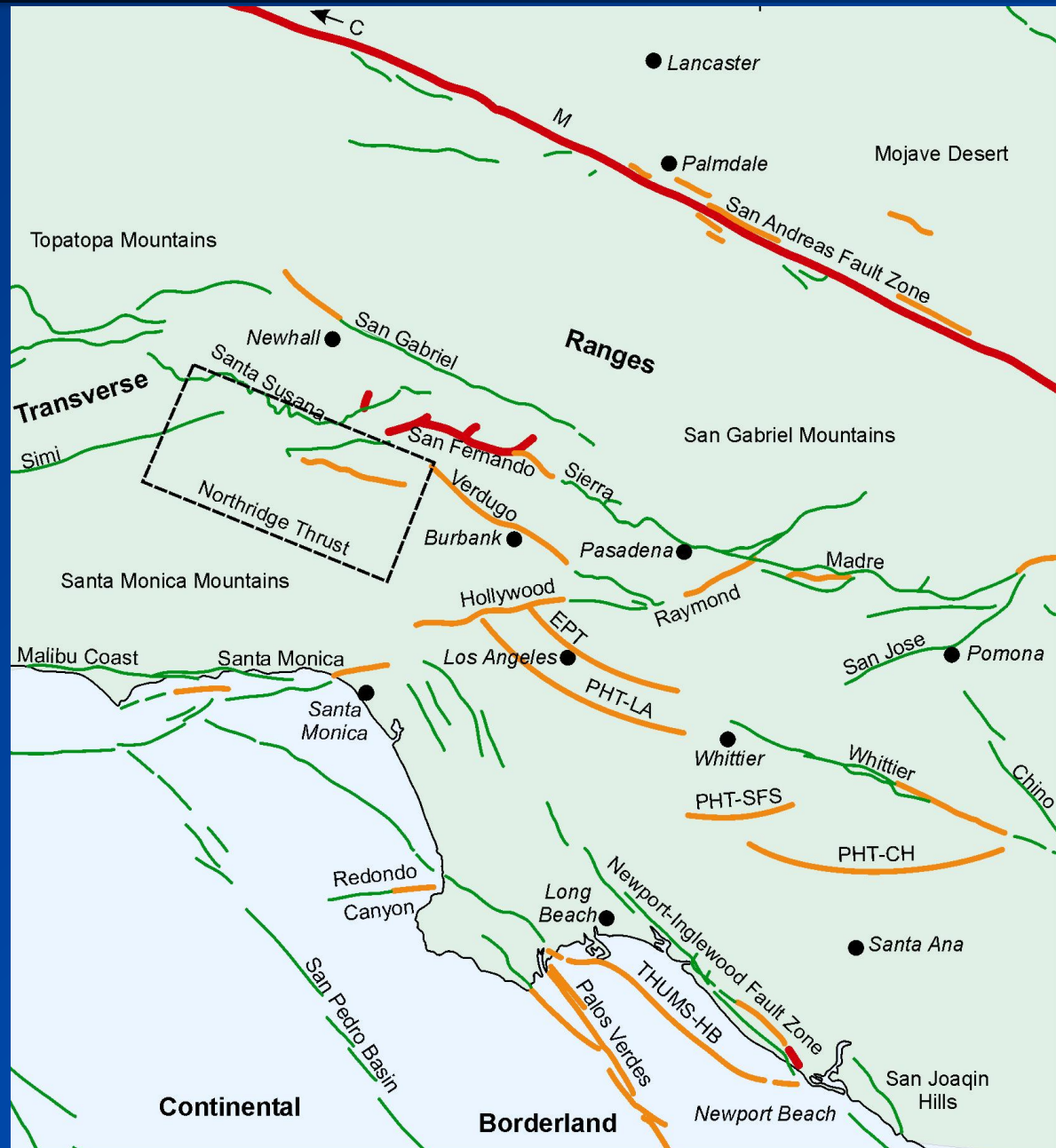
NGA Equations with Basin Depth Terms

- Abrahamson & Silva – Z1.0

- Campbell & Bozorgnia – Z2.5

- Chiou & Youngs – Z1.0

Site

$Z_{1.0}$

$V_S = 1$ km/s

Depth

$Z_{2.5}$

$V_S = 2.5$ km/s
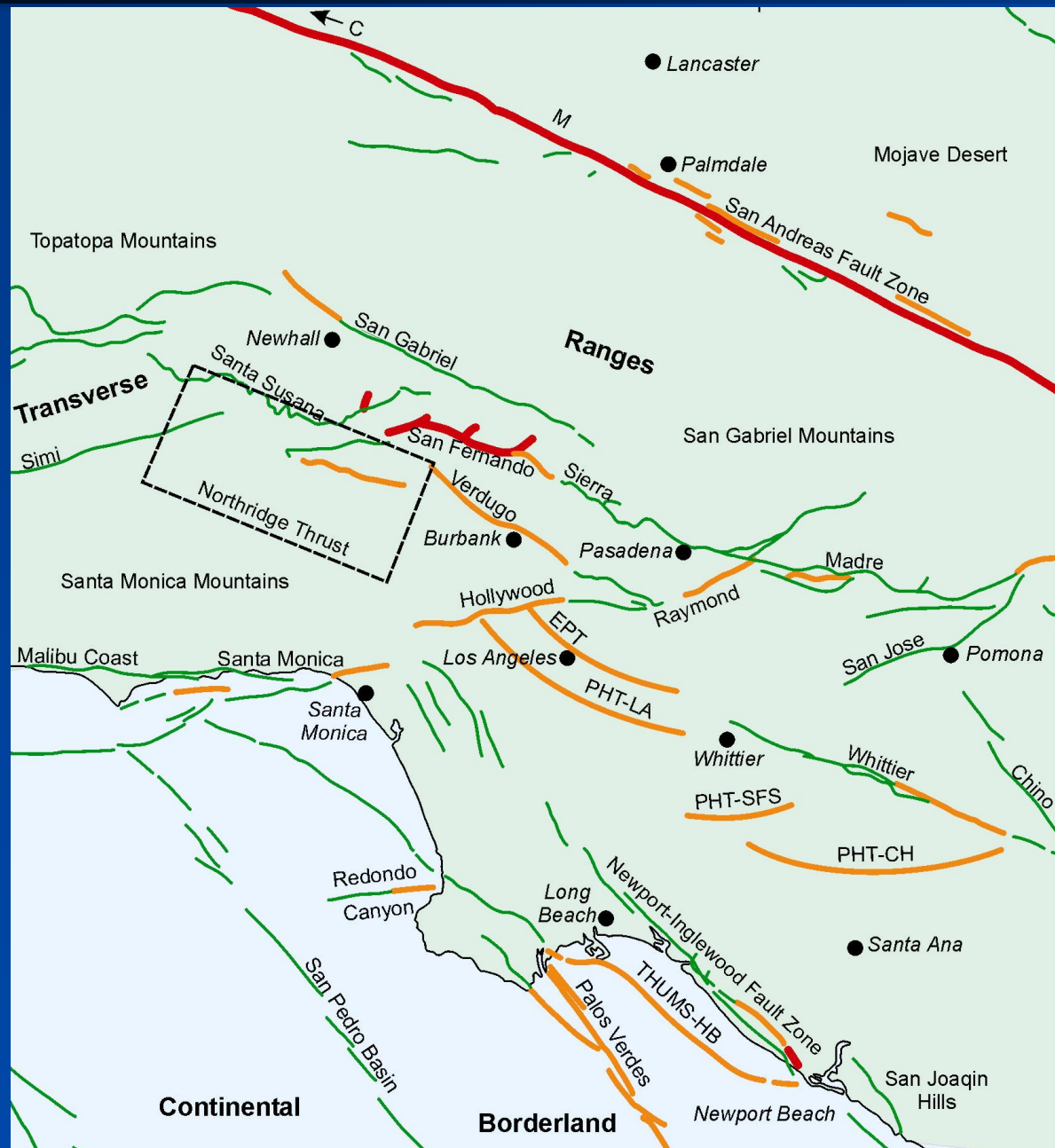
Basin Profile

$S\,C\!/\!E\,C$

1. **Lack of Local Strong Motion Records**

   (Only 1994 M6.7 Northridge & 1971 M6.6 San Fernando EQ)

Approach

1. Characterize fault Mw recurrence (SCEC UCERF)

2. Perform simulations

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   3-comp. accelerograms

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   response spectra, $S_a(T)$

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   median $S_a(T)$
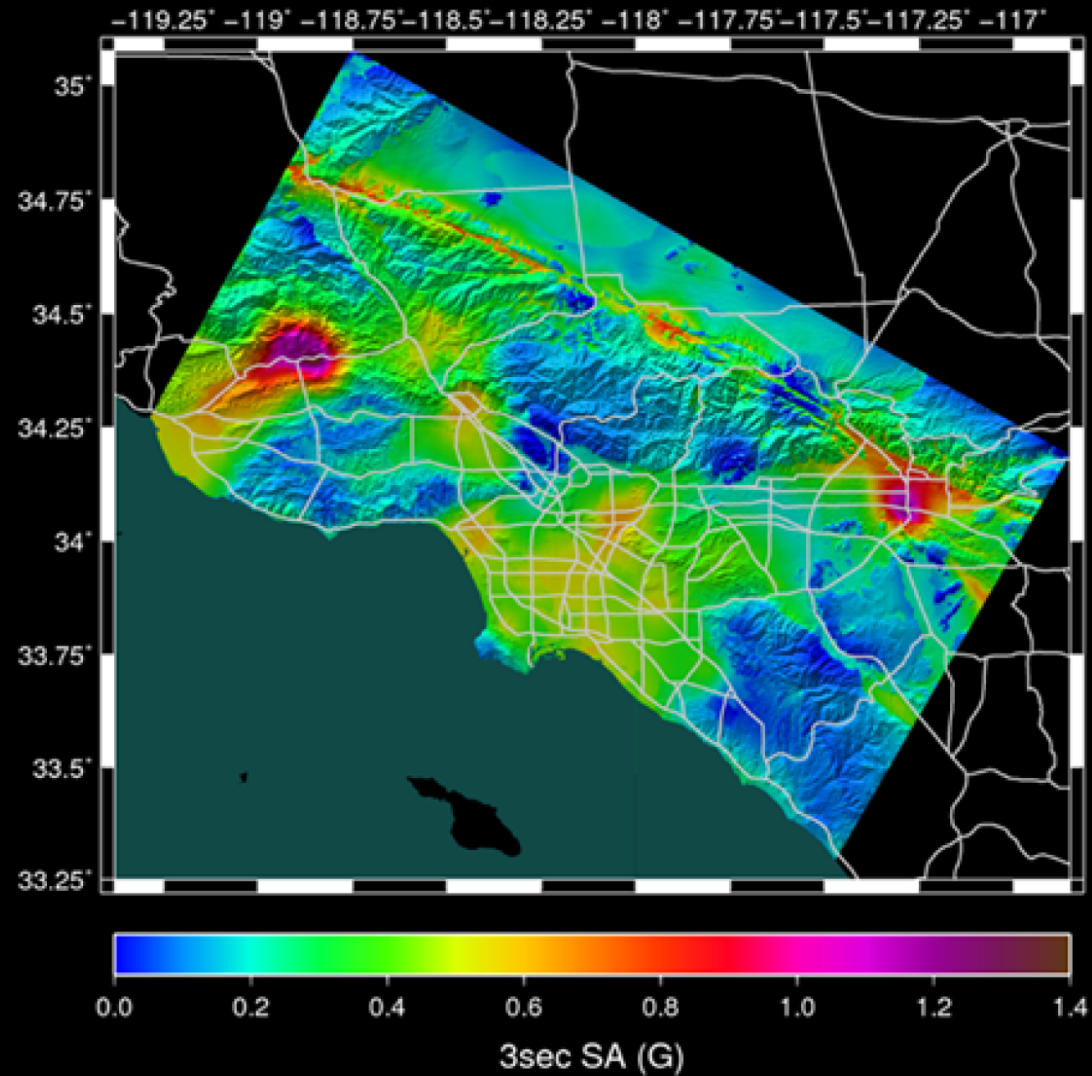
3. Select σ_{ln}

4. Proceed with PSHA/DSHA

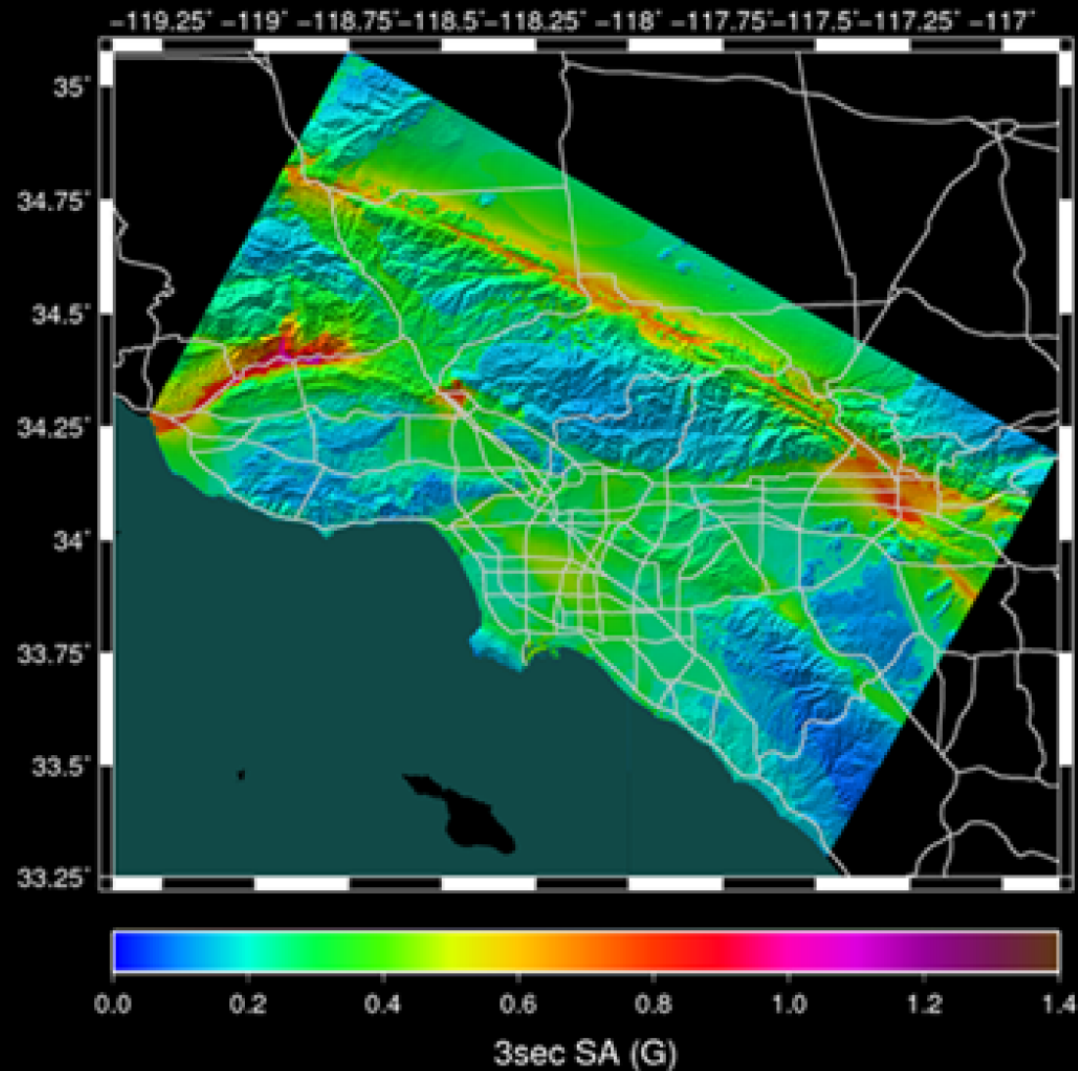# L.A. Pilot Study End Poducts

Contour Maps of $S_a(T)$

for

Selected T in $1 \leq T \leq 10$ sec range

Los Angeles Region Hazard Map, 2% in 50-yr SA (3 sec)
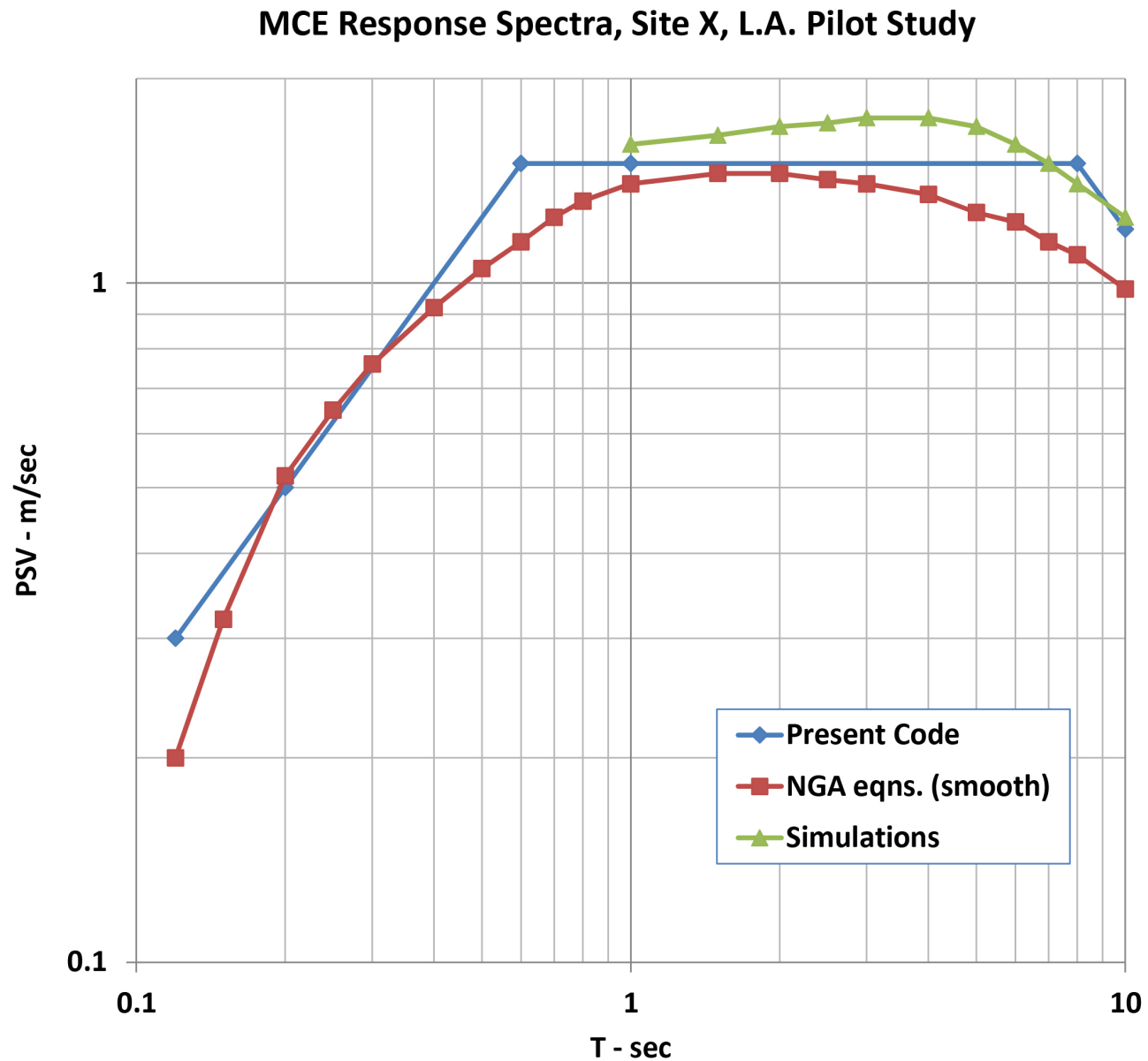Graves et al. (2010) CyberShake Simulations

Graves et al. (2010) – Fig. 9

Los Angeles Region Hazard Map, 2% in 50-yr SA (3 sec)
Campbell & Bozorgnia (2008) NGA eqn.

Graves et al. (2010) – Fig. 9

MCE Response Spectra, Site X, L.A. Pilot Study

MCE Response Spectra, Site X, L.A. Pilot Study

Pilot Study

- Technical Approach – CyberShake

- Management Approach

  Committee
  (subcommittee of SCEC GMSV committee)

  - Project Director

  - Seismologists – Perform CyberShake

  - Engineering Seismologists & Structural Engineers
    (code seismic committees)

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