Support of SCEC Committee for Utilization of Ground Motion Simulations (UGMS)

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SCEC GMSV Workshop

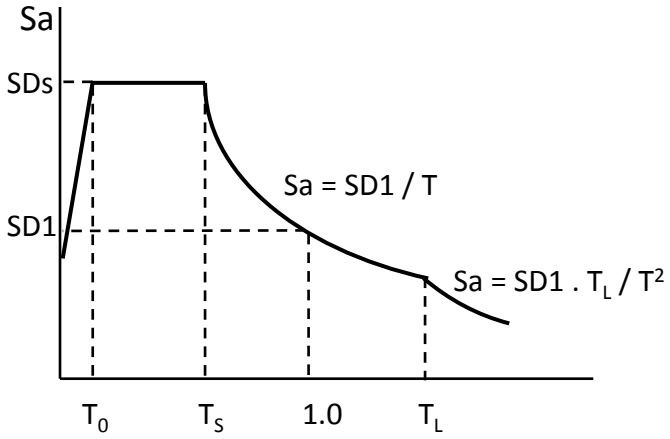
9/8/2013

UGMS – C.B. Crouse :

GOAL :

- Improving seismic provisions in US codes through ground motion simulations (next generation seismic codes)

- Computing long period Sa (1< T <10s)
  - Current approach :



  - New approach :

    Use 3-D numerical models

    Application: Urban Areas

    Primary product: long period Sa maps

    Secondary product: simulated time histories

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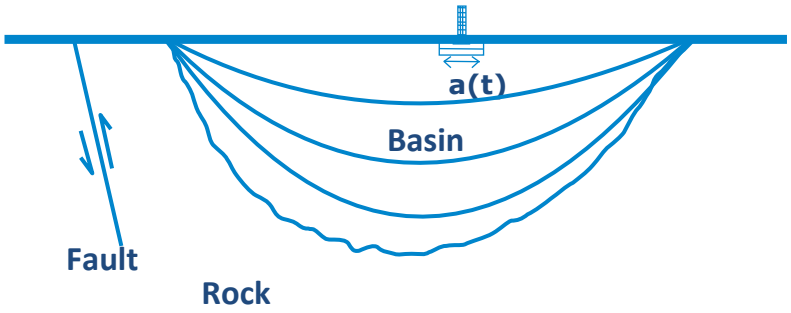
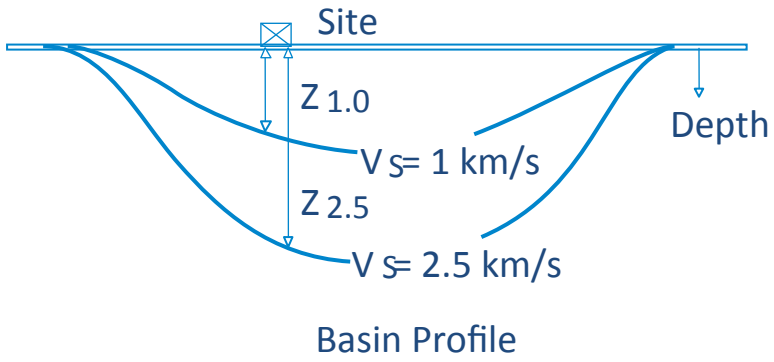
BASIN EFFECTS :

- Simulate 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

  (NGA-West2 now available)



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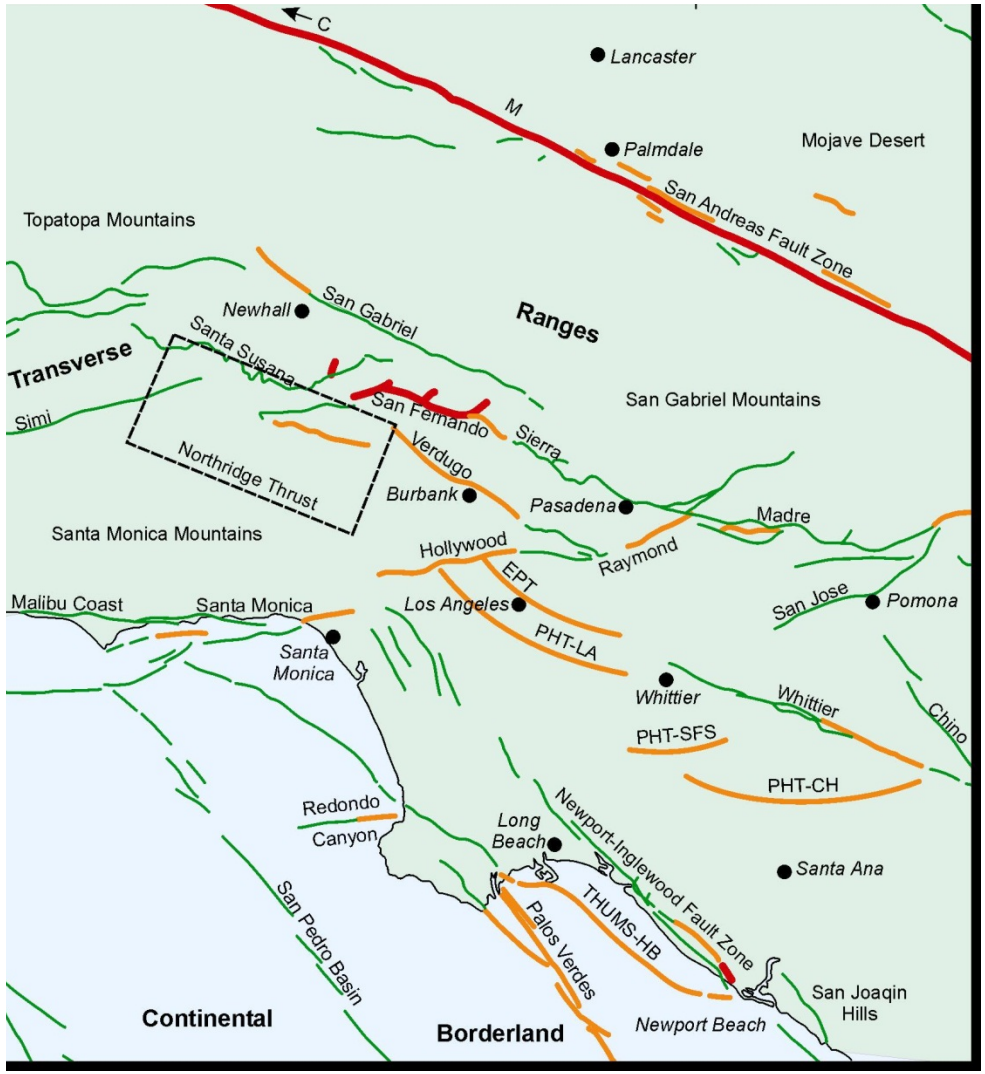
Limitation of empirical approach – Los Angeles

Lack of Local Strong Motion Records

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



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Approach:

1. Characterize fault Mw recurrence (SCEC UCERF)

2. Perform simulations

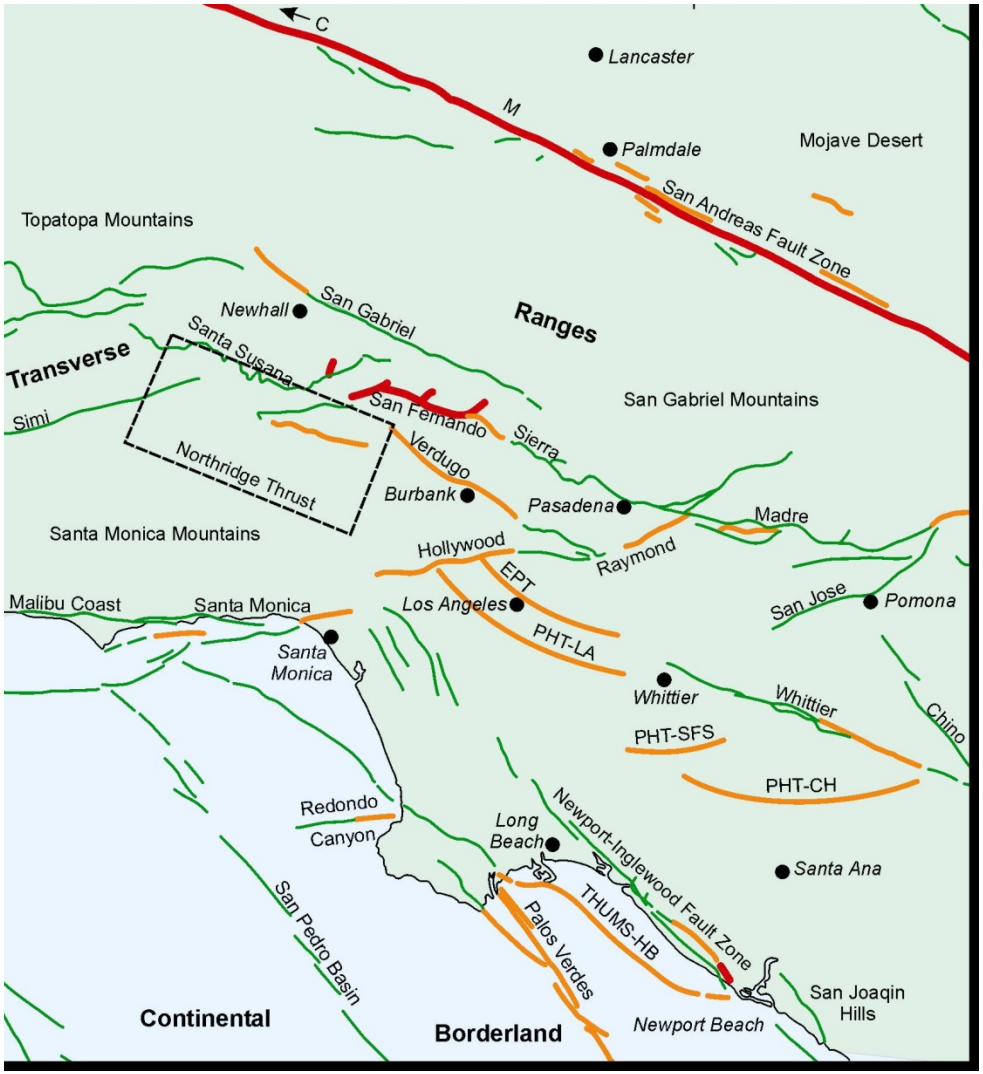
   → 3-comp. accelerograms

   → response spectra, $S_a(T)$

   → median $S_a(T)$

3. Select σ_{ln}

4. Proceed with PSHA/DSHA



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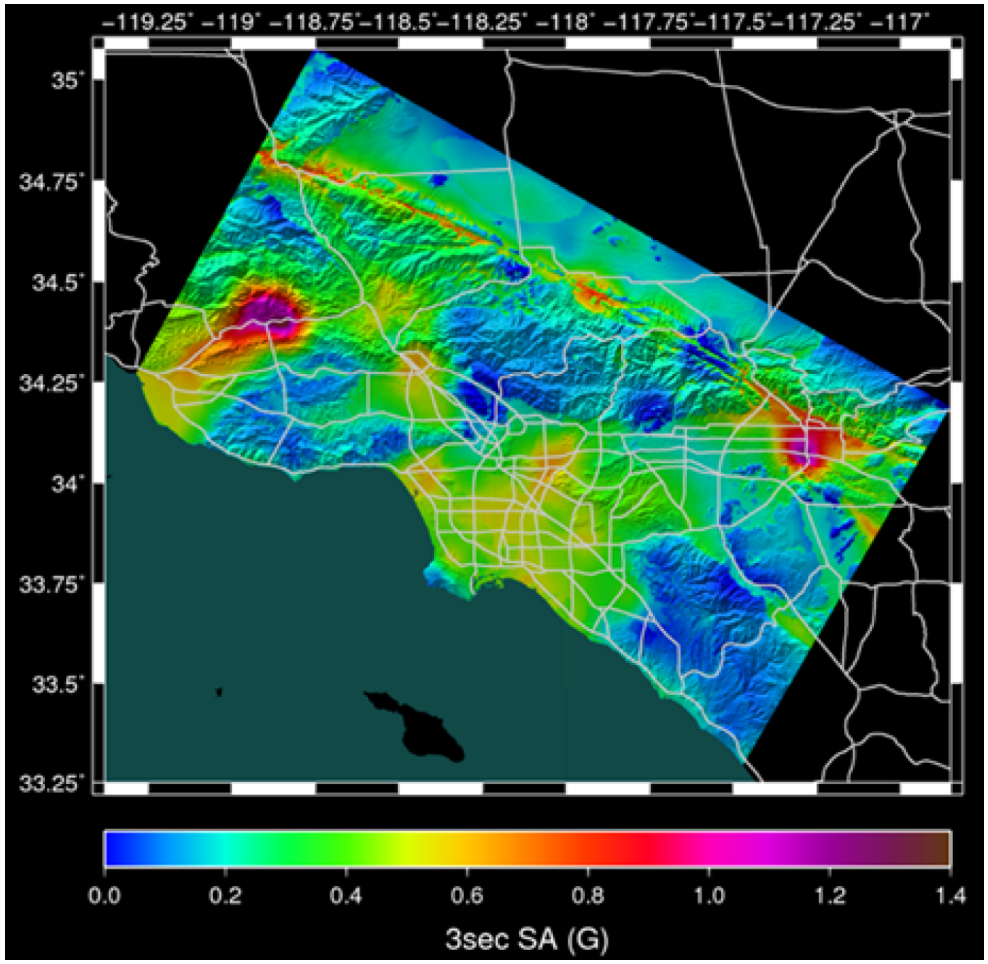
L.A. Pilot Study :

End Products: Contour Maps of Sa(T)

Example: Graves et al. (2010)-fig9

Cybershake simulations

Los Angeles Region Hazard Map, 2% in 50-yr SA (3 sec):



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Pilot project proposal :

1. Select L.A. sites
2. PSHA/DSHA using 3-D simulations
3. PSHA/DSHA using NGA-West
4. Compare 2 & 3
5. MCE_R Response Spectra according to ASCE 7-10 (max direction, fragility)

What is needed from GMSV TAG and/ or BBP Validation Project:

- Validation of Cybershake simulations for use in developing MCE_R response spectra, which introduces …
  - validation of 3D simulations
  - validation specifically for long-period spectral accelerations
  - validation of s of spectral accelerations
- Validation of Cybershake simulations for use in nonlinear response history analysis of buildings