



NGA-East SSHAC Workshop 3C Adjustment for Gulf Coast Region



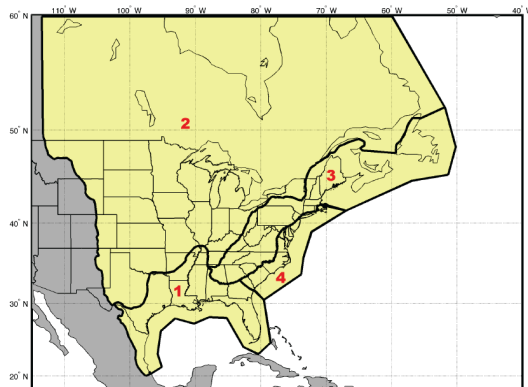
TI Team
and
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<http://peer.berkeley.edu/ngaeast/>

NGA-East SSHAC Workshop

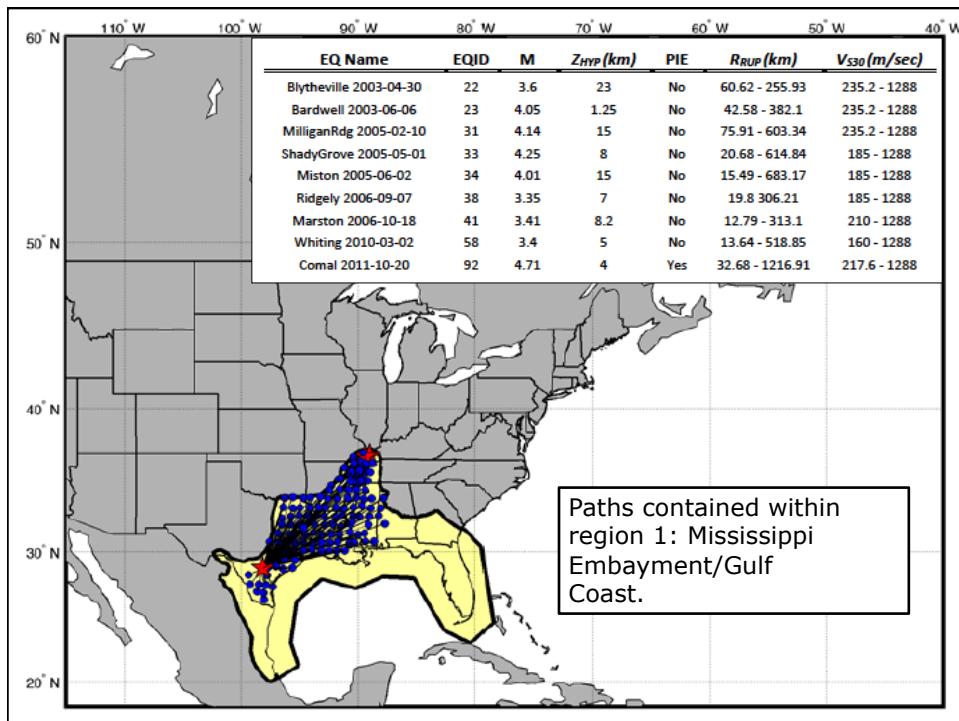
June 17-18, 2015

CENA Regions

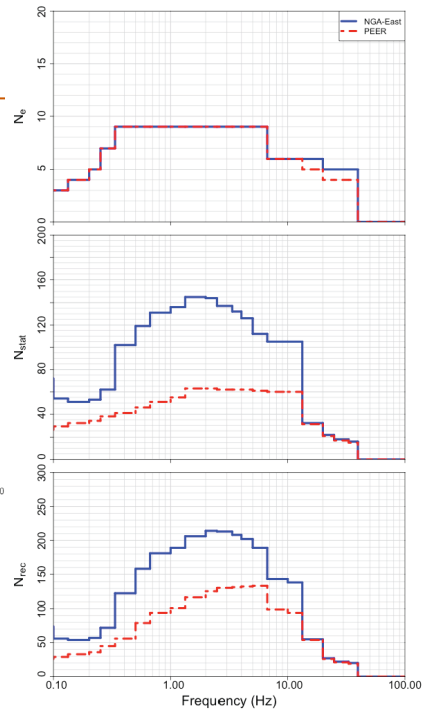
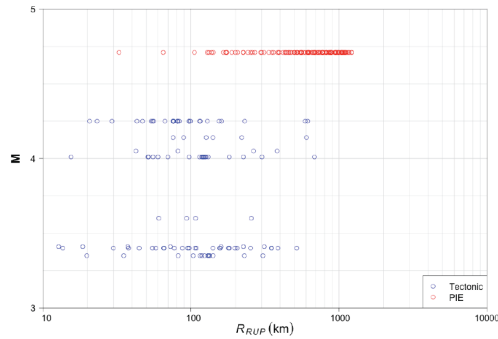


Gulf Coast Adjustment

- General approach, develop sets of PSA ratios to adjust median models to the Gulf Coast.
 - e.g., $PSA_{GC} = PSA_{CNA} * GC_{RATIO}$
- Two (or three) alternative models for GC Ratio:
 - Models developed by PEER
 - Model developed by DASG
 - Model developed by Chapman (received 6/12, PSA modeling on-going now)



Region 1 data



PEER Modeling

- Calculate residuals of GC (Region 1) data to PEER NGA-East model.
- Fit simple adjustment model to residuals:

$$\Delta_{GC} = c_0 \quad R_{RUP} < 100 \text{ km}$$

$$\Delta_{GC} = c_0 + c'_7 (R_{RUP} - 100) \quad R_{RUP} \geq 100 \text{ km}$$

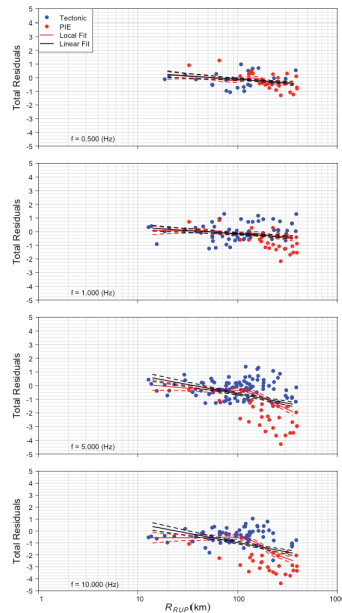
$$\ln(PSA_{GC}) = \ln(PSA_{CENA}) + \Delta_{GC}$$

$$\ln(PSA_{GC}) - \ln(PSA_{CENA}) = \Delta_{GC}$$

$$\ln\left(\frac{PSA_{GC}}{PSA_{CENA}}\right) = \Delta_{GC}$$



PEER modeling Total residuals GC data, CNA GMM



7 

PEER Modeling

$$\Delta_{GC} = c_0 \quad R_{RUP} < 100 \text{ km}$$

$$\Delta_{GC} = c_0 + c'_7 (R_{RUP} - 100) \quad R_{RUP} \geq 100 \text{ km}$$

- Included events from NGA-East database in Region 1 $M \geq 3.0$
- Included records $R_{RUP} \leq 400 \text{ km}$
- No restrictions on V_{S30} (Range from 160 - 1288 m/sec)

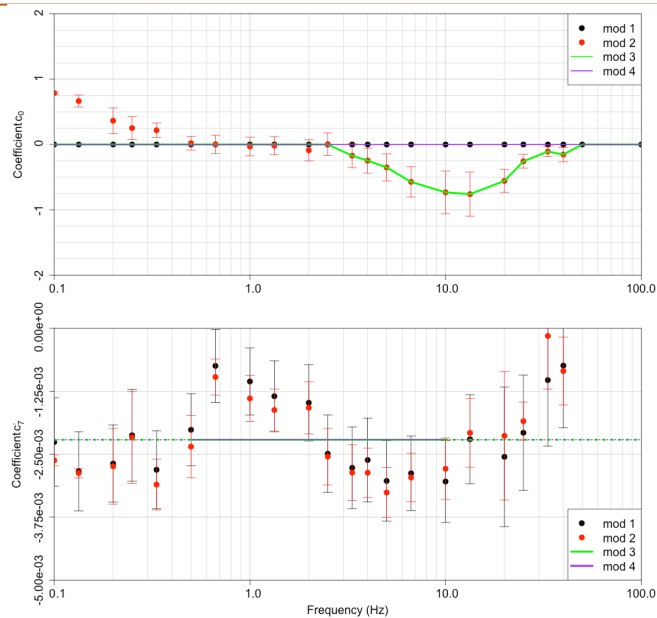


PEER Modeling

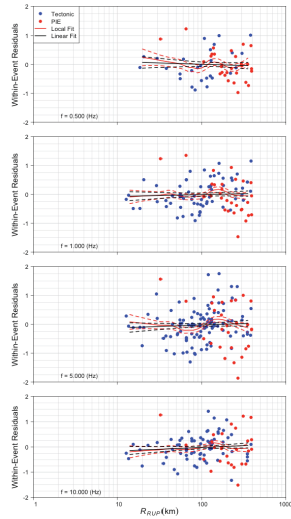
- Used mixed effects model including a random effect on c_0 grouped by event (event term).
- Fit model two ways
 1. Force $C_0 = 0$ (fixed effect is known a priori)
 2. Allow C_0 to be a free parameter.
- Generate 2 more model variants and evaluate



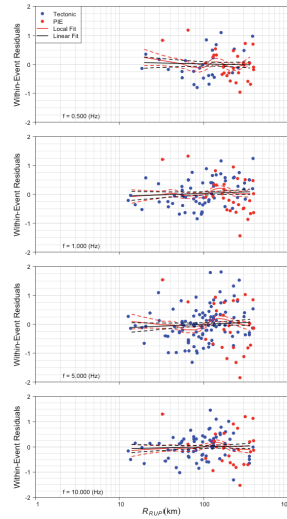
PEER Modeling



PEER Model within-event residuals



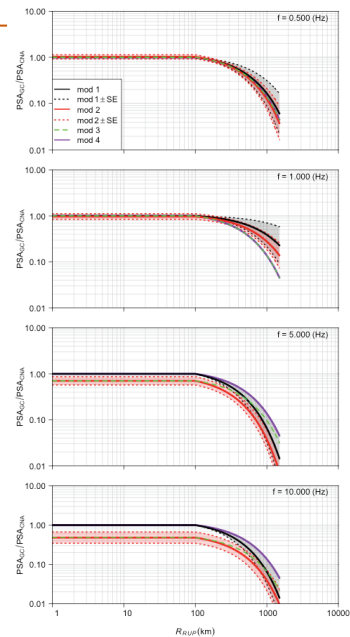
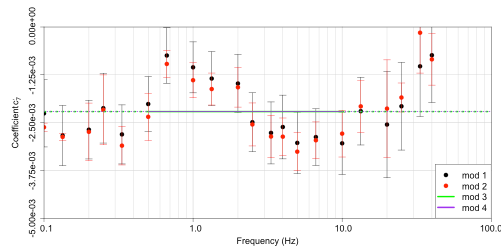
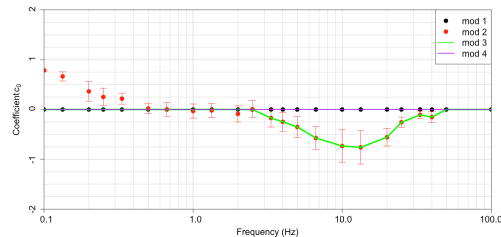
Model 1 within-event residuals plotted against rupture distance for PSA at frequencies 0.5, 1.0, 5.0, 10.0 Hz. Blue points are observations from tectonic events and red points are observations from PIE.



Model 2 within-event residuals plotted against rupture distance for PSA at frequencies 0.5, 1.0, 5.0, 10.0 Hz. Blue points are observations from tectonic events and red points are observations from PIE.



PEER models

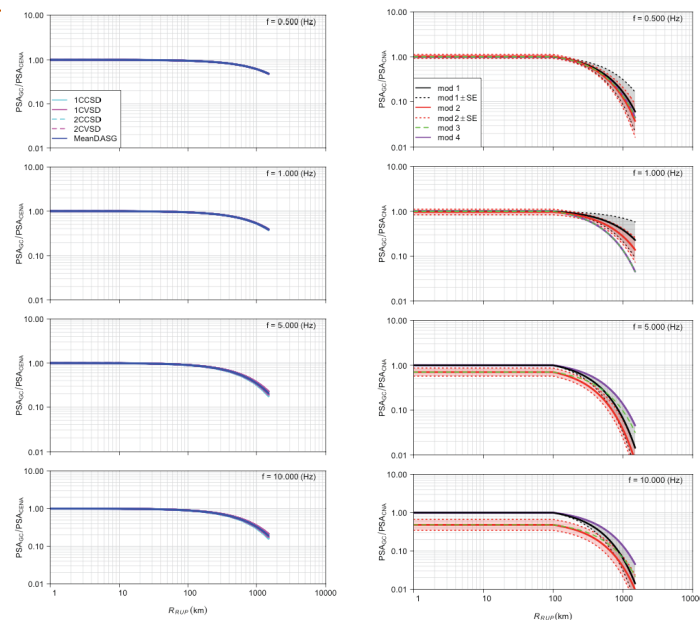


DASG Model

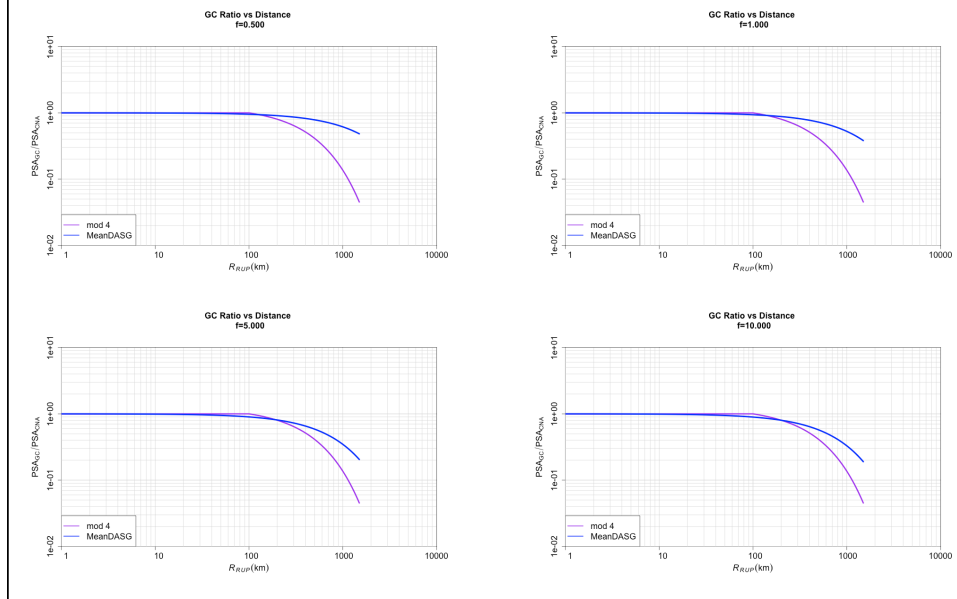
- Re run inversions for Gulf Coast (Region 1) data.
- Obtain Q_o for Gulf Coast ($\sim 50\%$ reduction relative to Q_o of mid continent).
- Re run simulations for all 4 models (1CCSD, 1CVSD, 2CCSD, 2CVSD) and recompute c_g coefficient of GMPEs.
- Calculate Ratios of GC models to CENA models



DASG Model



TI Team Preferred Models



Next steps

- Evaluate model by Chapman
 - Q-only: comparable to DASG and PEER or is it a third model?
 - Decide on integration of kappa (function of sediment depth)
- Assign weights

