Preliminary Campbell-Bozorgnia NGA-West 2 GMPE for PGA and PSA at 0.2 and 1.0 sec

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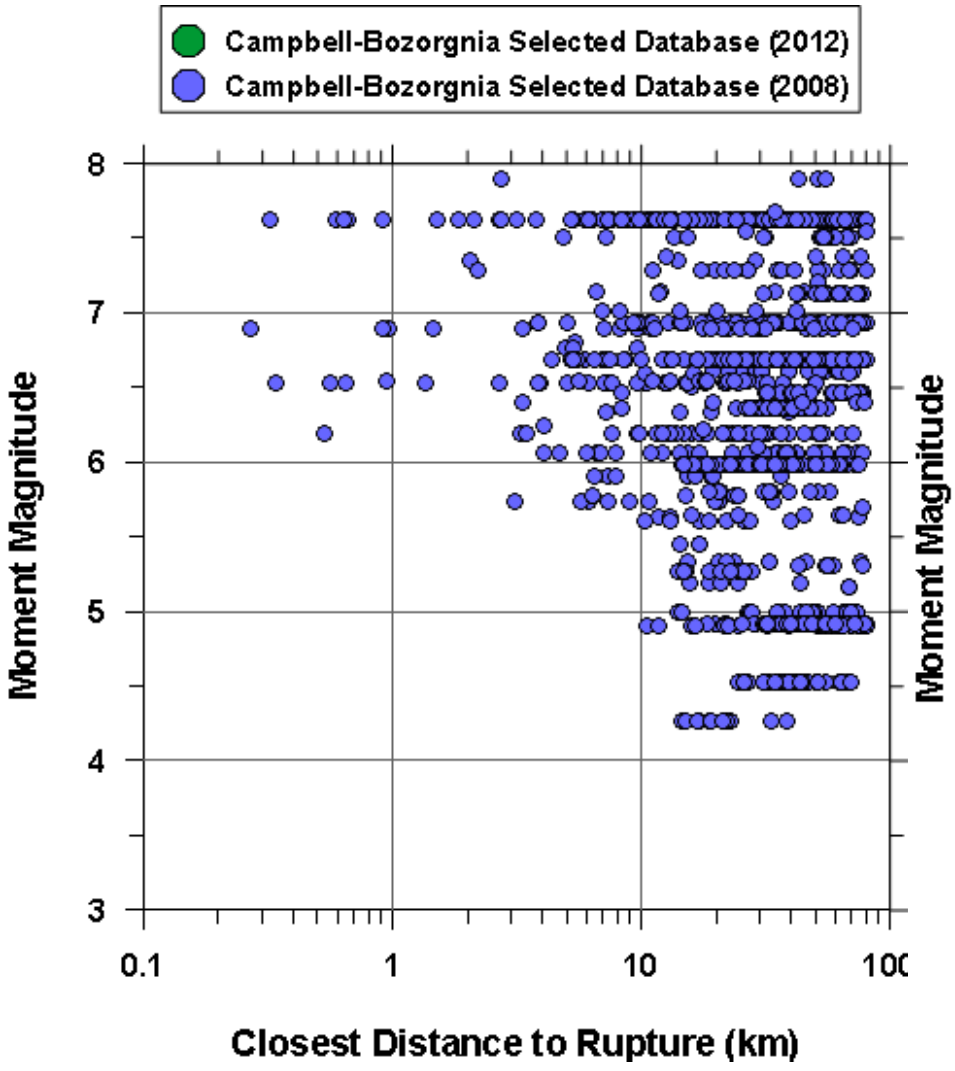
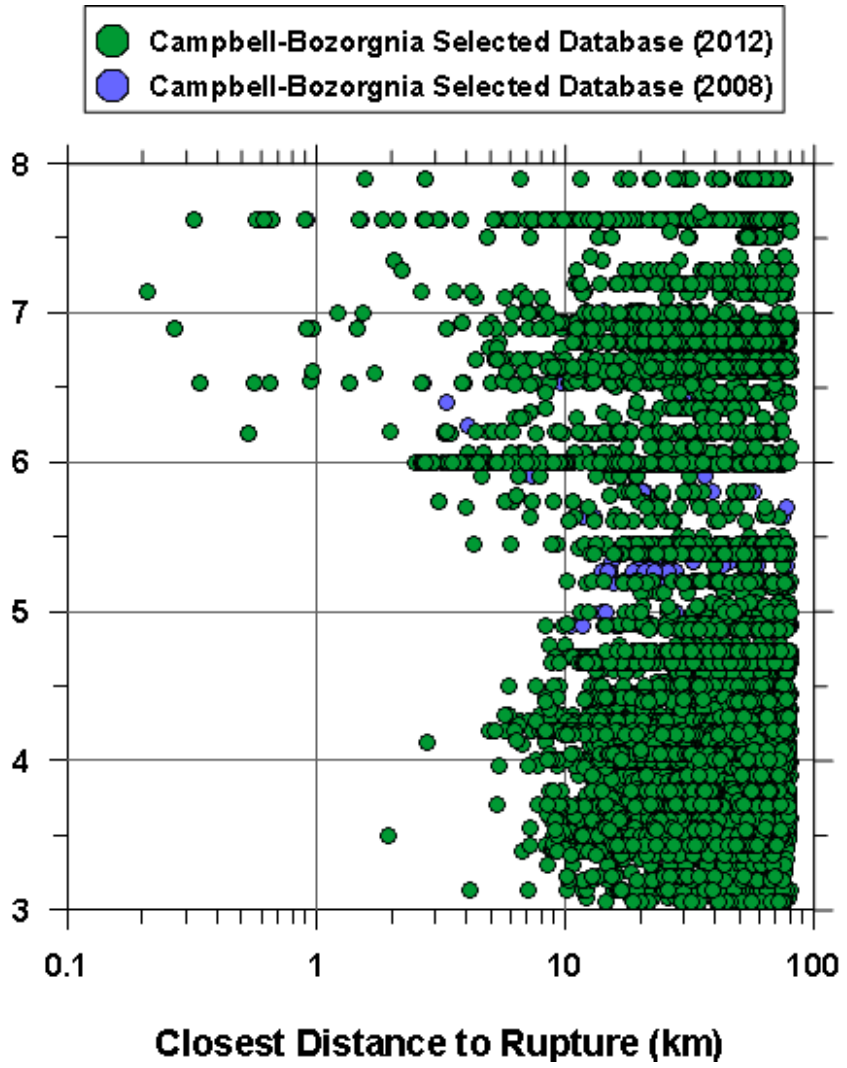
Data Selection Criteria

Data Selection Criteria

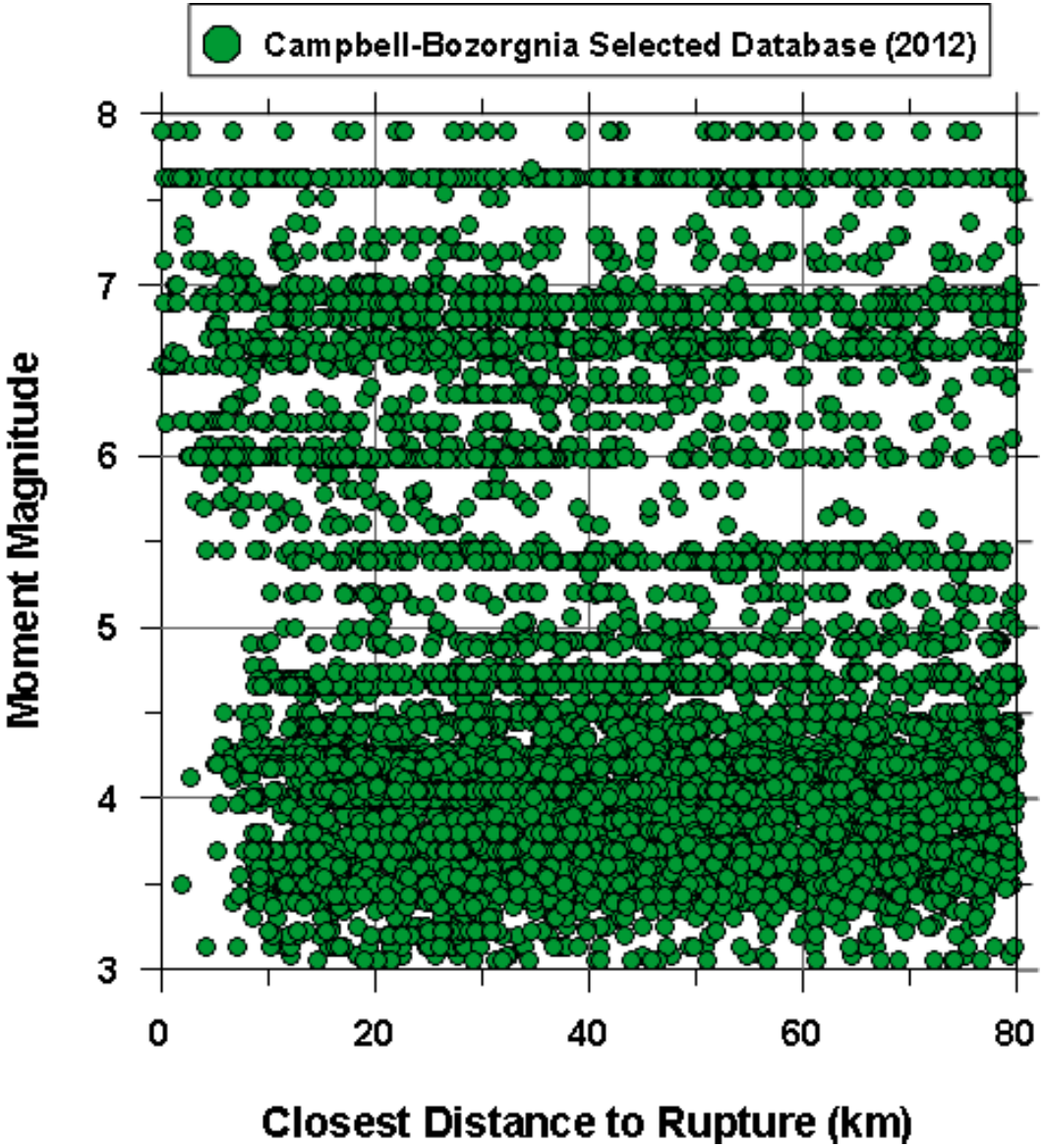
- Earthquakes
  - **M** = 3.0-5.5 California events
  - **M** = 5.5-7.9 California and global events
  - Known focal mechanism or fault type
  - Class 1 events using 10 km ΔR_{JB} criteria
- Sites
  - Free field (shelters, non-embedded bldgs.)
  - Known or estimated (via proxies) V_{S30}
  - $R_{RUP} \leq 80$ km (geometric attenuation only)
  - N≥5 (**M**<5.5), N≥3 (5.5≤**M**<6.5), N≥1 (**M**≥6.5)

CB08 vs. CB12 Databases





CB12 Database



Changes from 2008 NGA-West 1 GMPE

Changes from 2008 GMPE

- Quadralinear magnitude scaling term
  - Added additional hinge at **M** = 4.5
  - No longer overpredicts at small **M**
- Hanging-Wall term from simulations
  - Functional form by Jennifer Donahue
  - Peaks over bottom edge of fault
  - Add 2008 distance filter off rupture plane
- Hypocentral depth term
  - Ground motion increases for H_{HYP} > 7 km
  - Preferred over Z_{TOR} (Z_{TOR} could be proxy)

Changes from 2008 GMPE

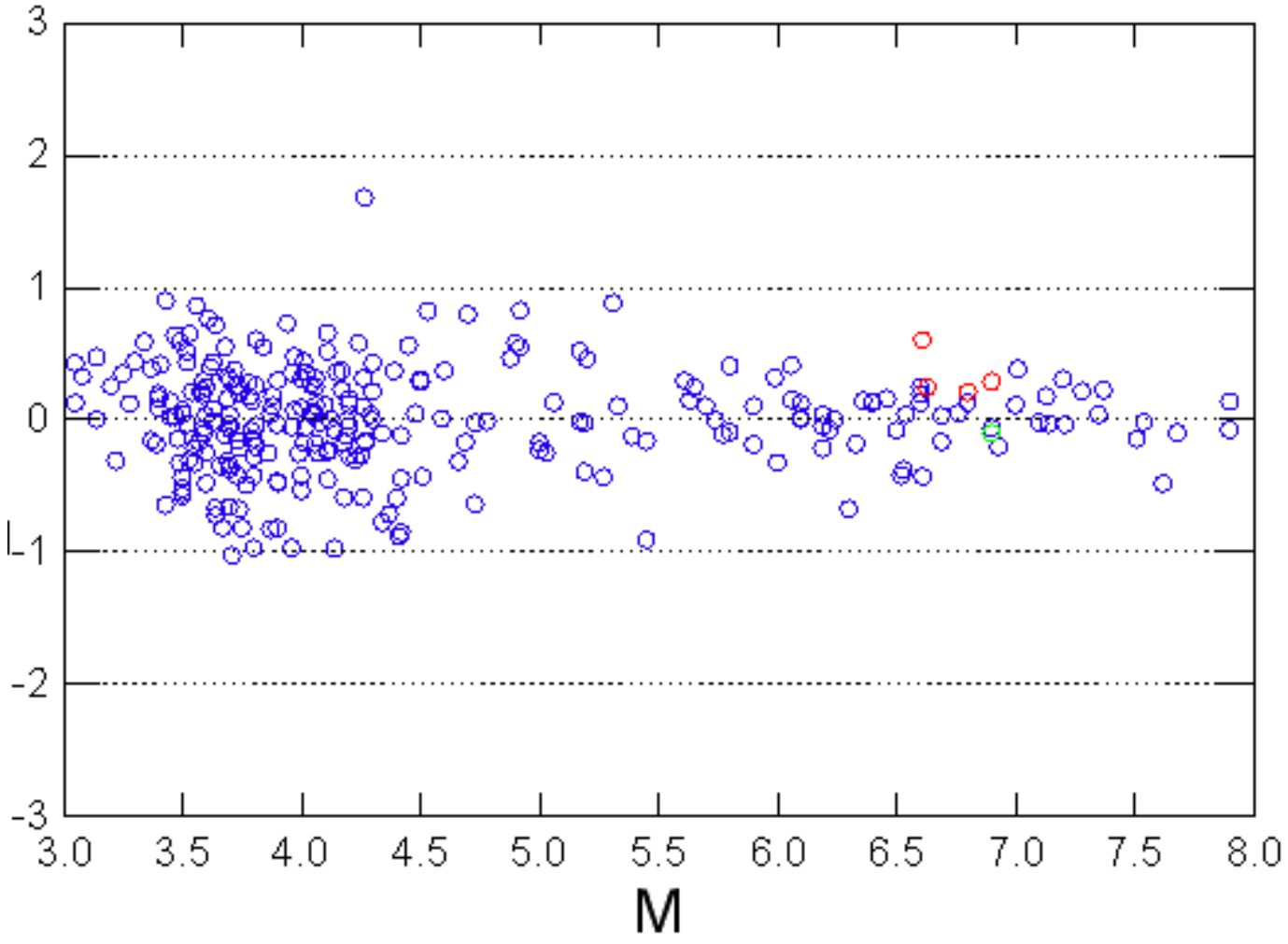
- Fault mechanism term
  - No longer depth dependent
  - Goes away at small magnitudes
- Rupture plane dip term
  - Ground motion increases with dip
  - Goes away at large magnitudes
- Shallow site-response (V_{S30}) term
  - Retained Walling nonlinear model
  - Different linear dependence in Japan
  - Japan model bilinear (hinge at 200 m/s)

Changes from 2008 GMPE

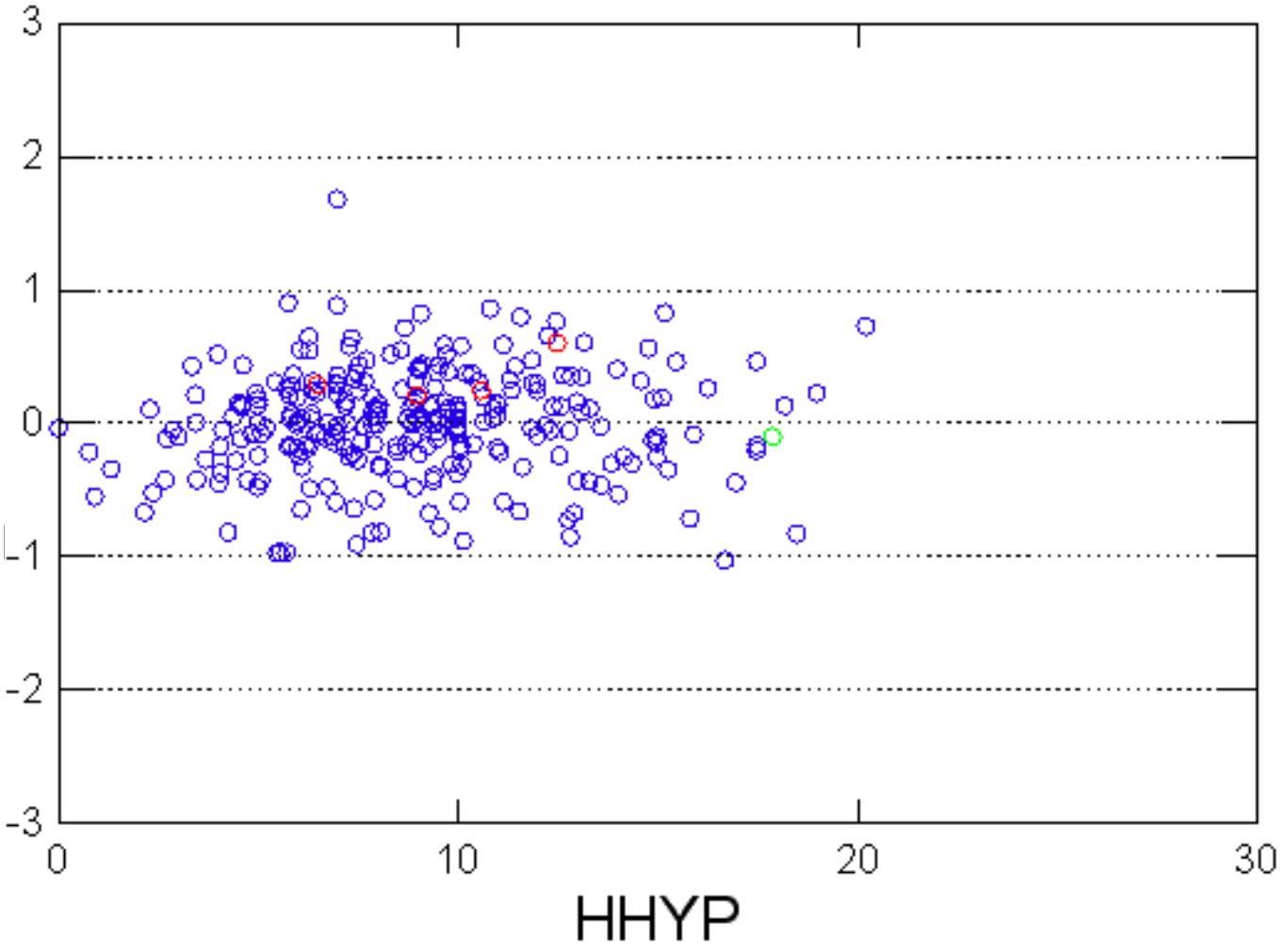
- Standard deviations
  - Similar to 2008 GMPE for **M** ≥ 5.5
  - Larger for **M** < 5.5

Model Validation: Example Residuals

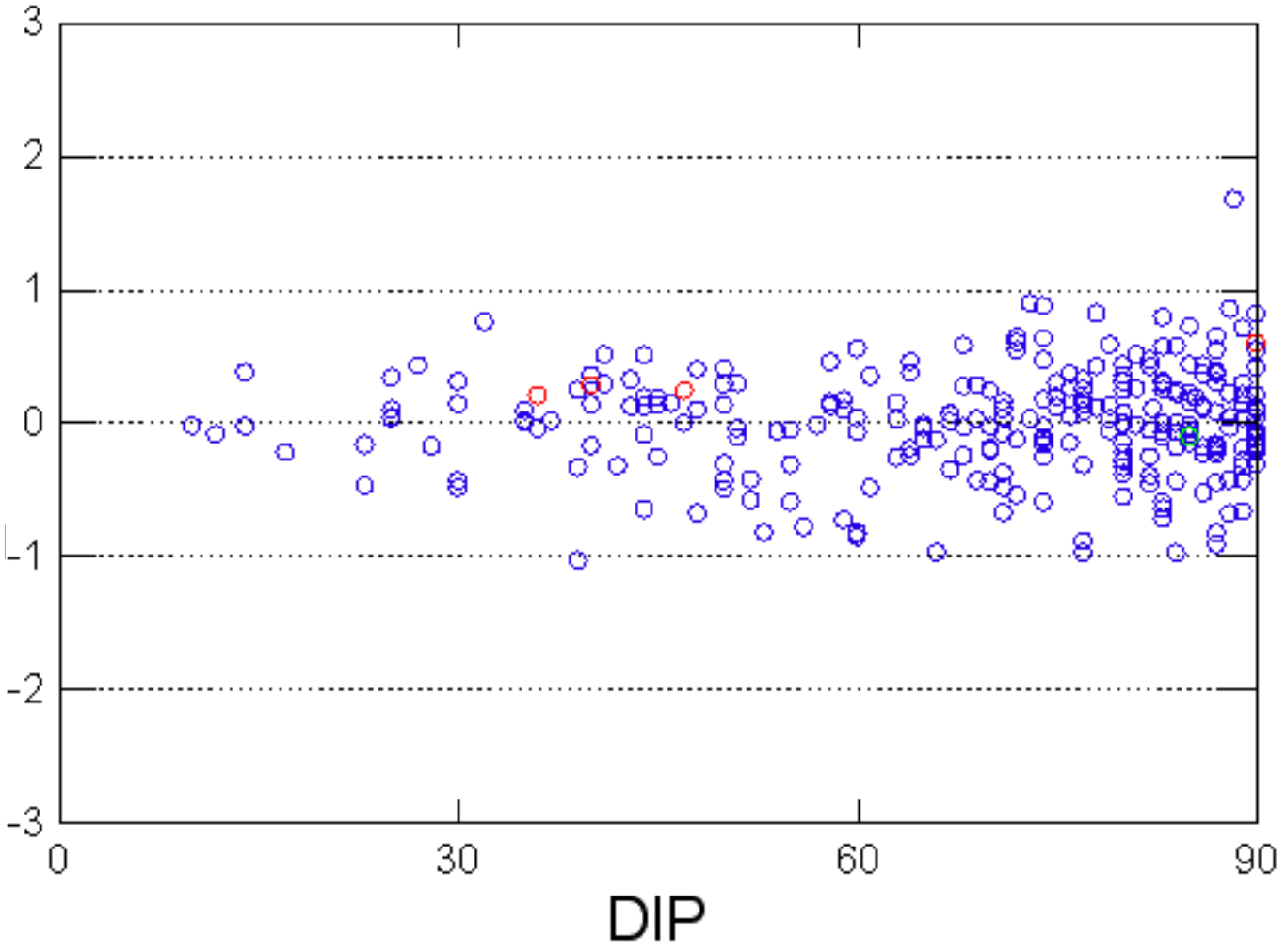
Between-Event vs. Magnitude



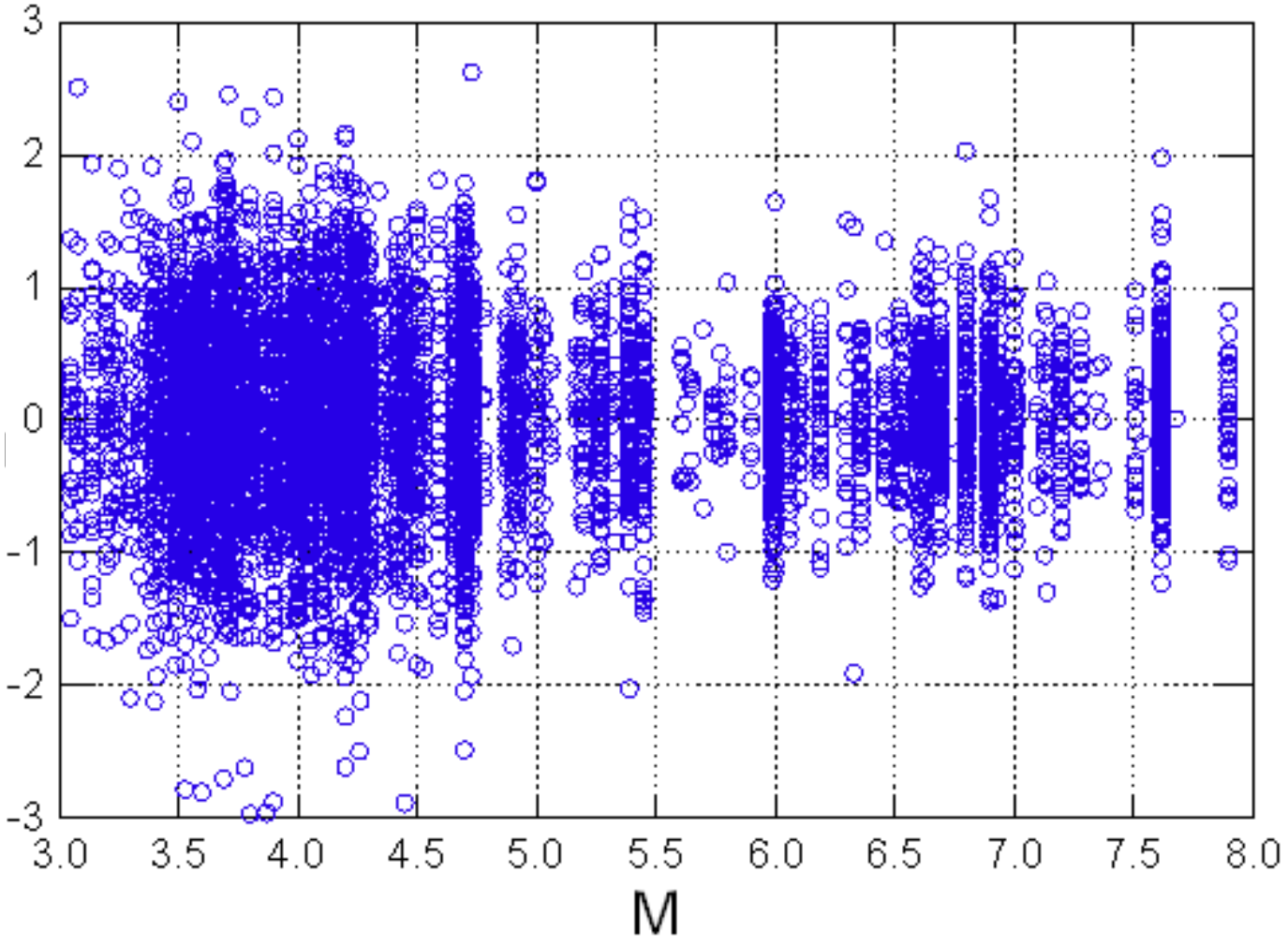
Between-Event vs. Depth



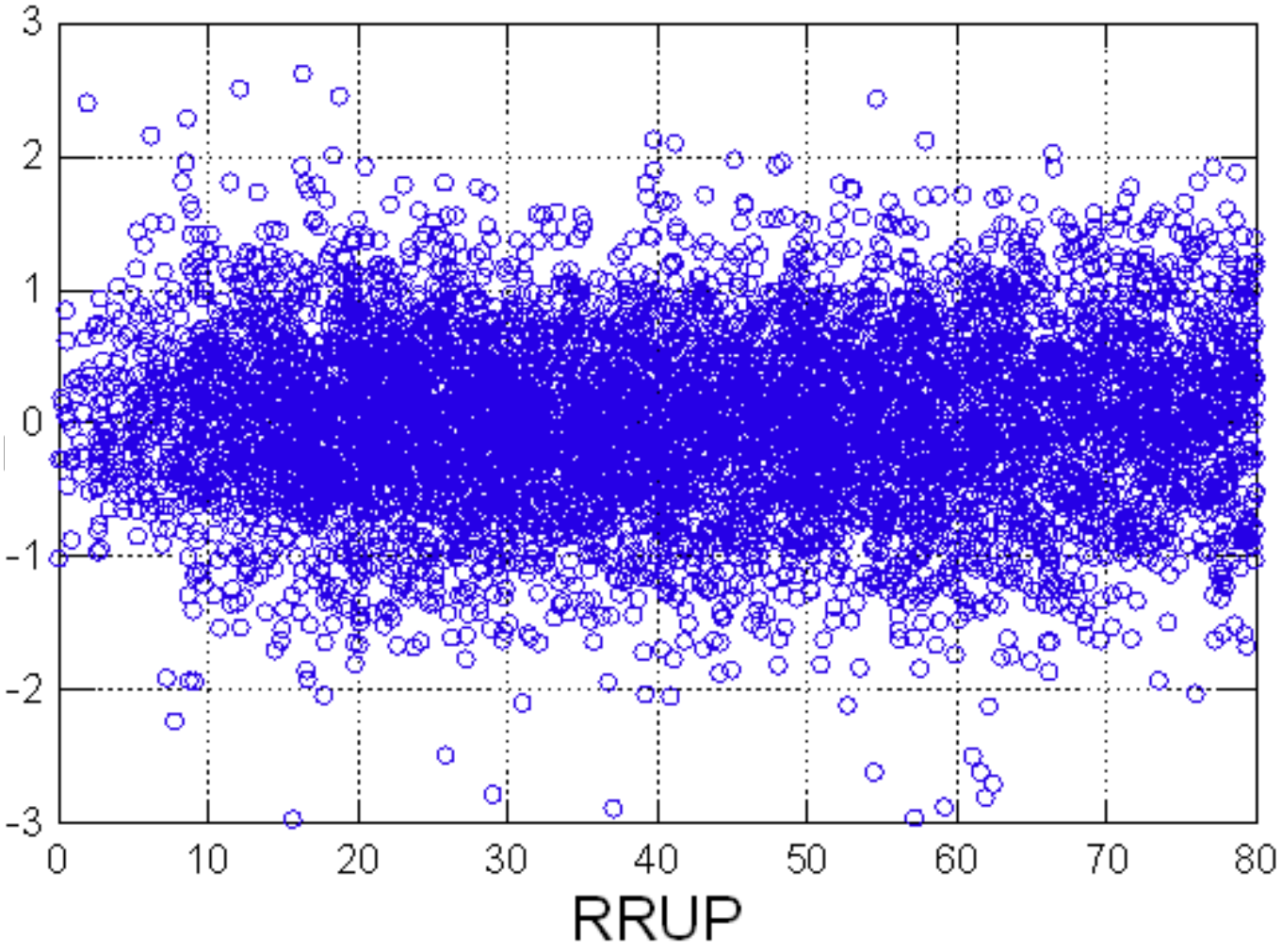
Between-Event vs. Dip



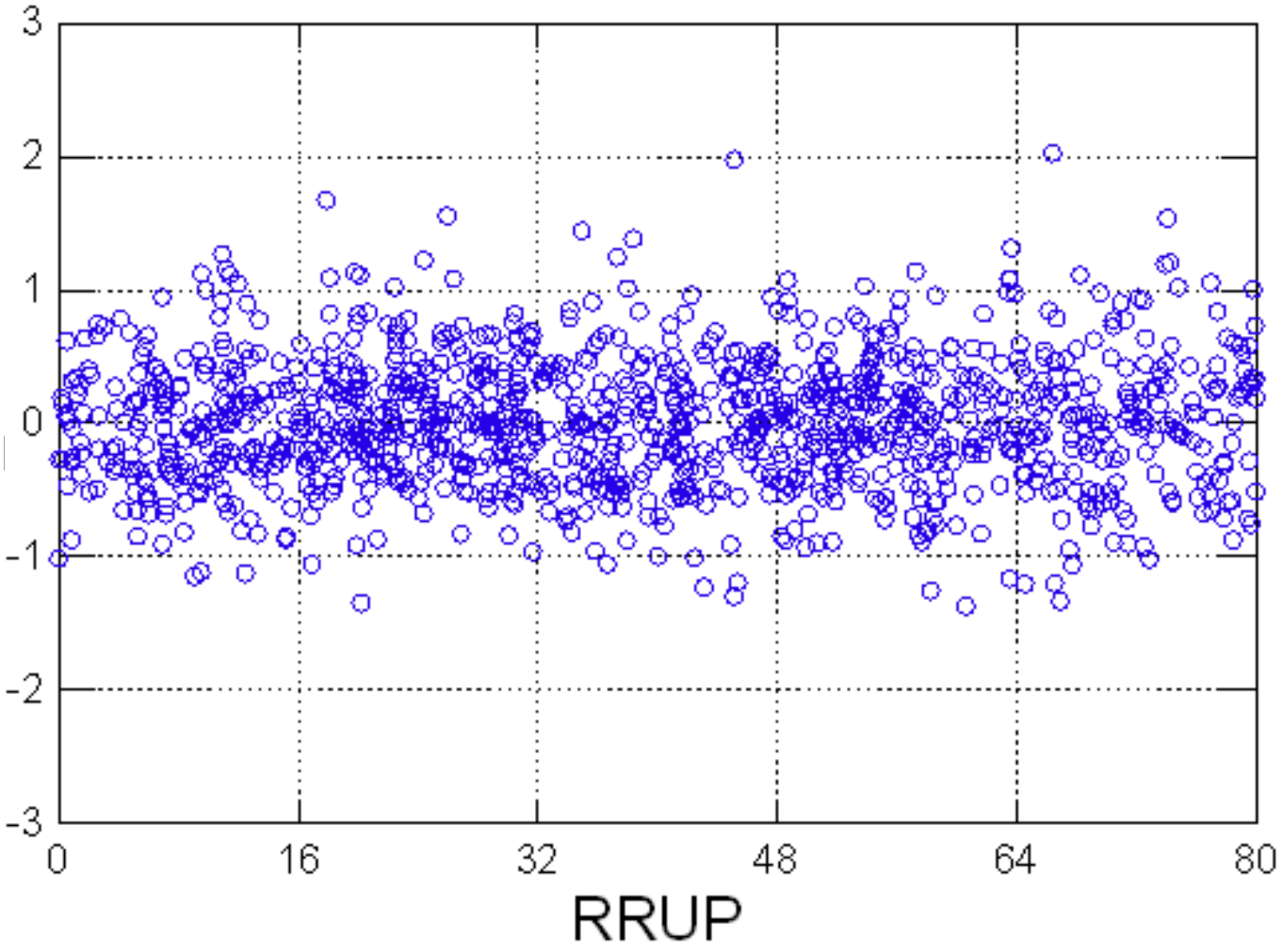
Within-Event vs. Magnitude



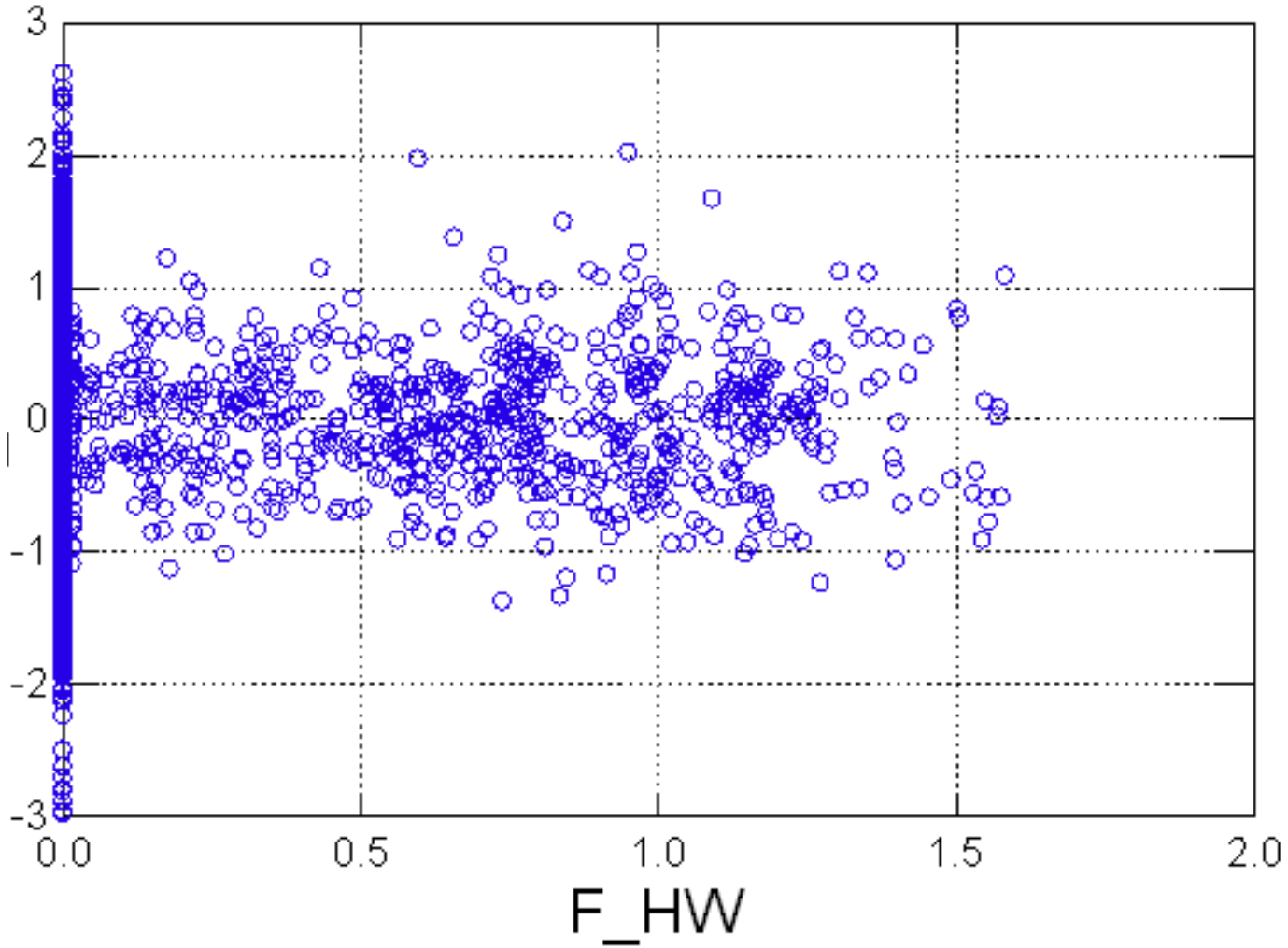
Within-Event vs. R_{RUP} (All **M**)



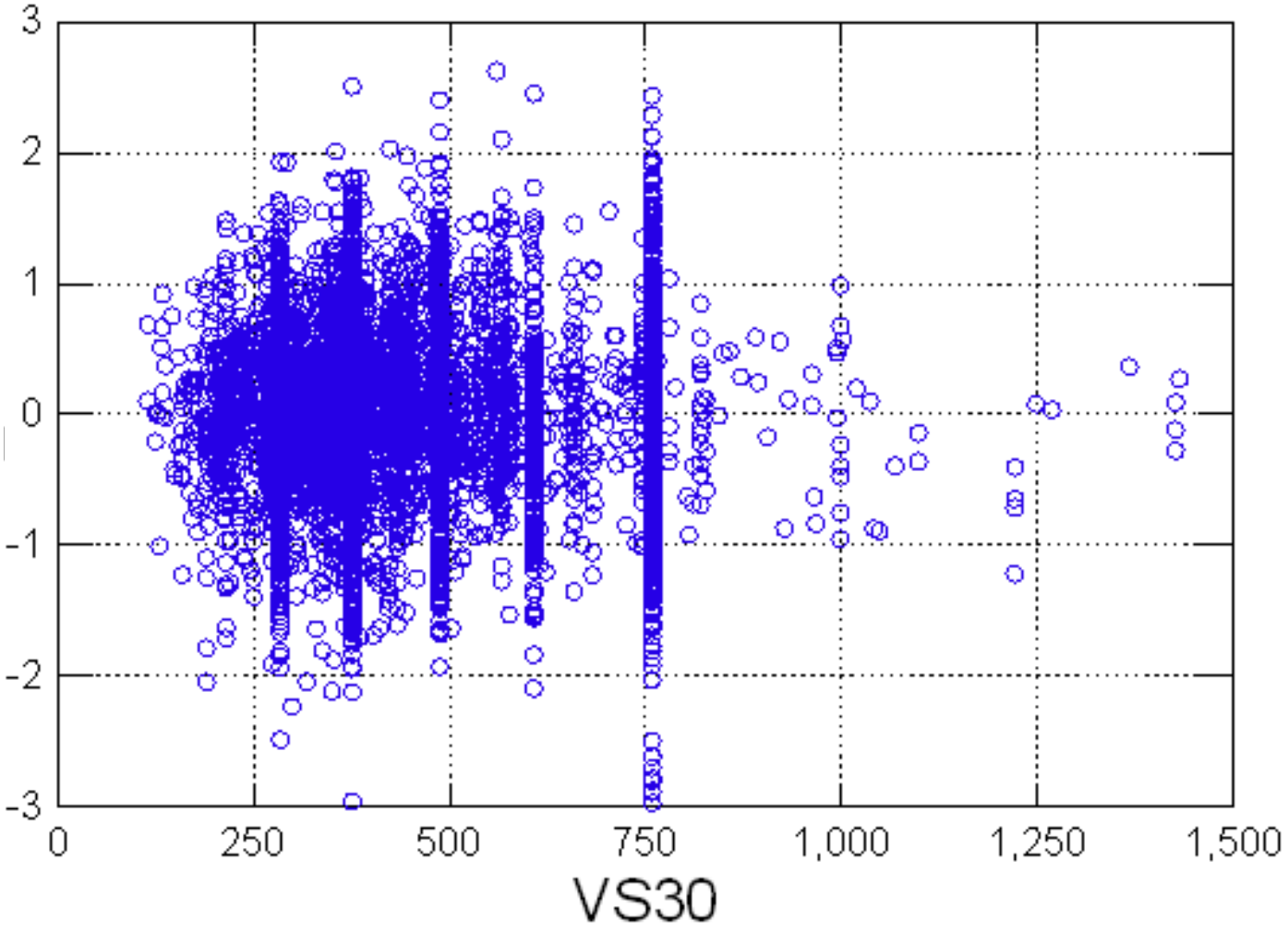
Within-Event vs. R_{RUP} (**M**>6.5)



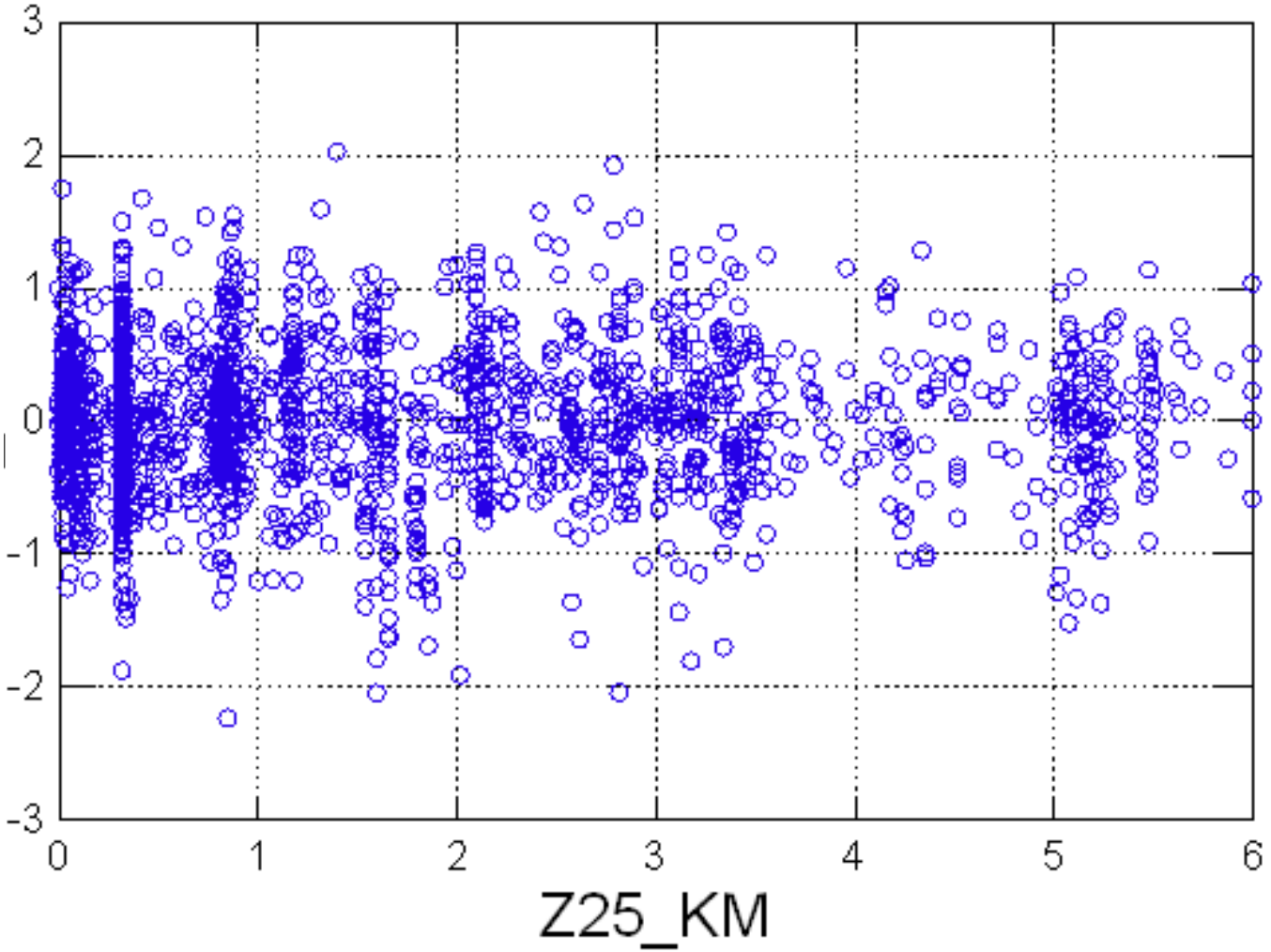
Within-Event vs. HW Term



Within-Event vs. V_{S30}

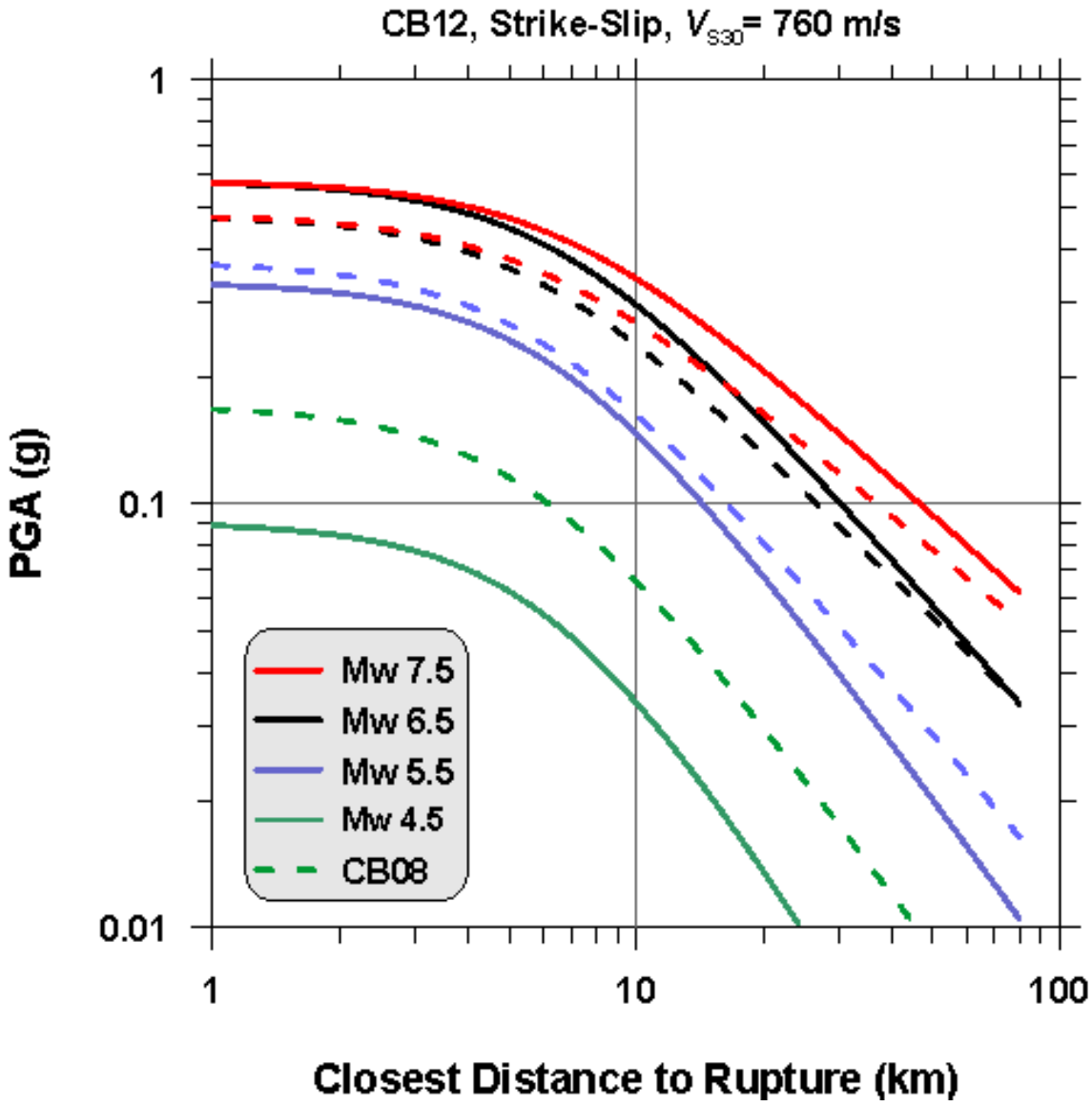


Within-Event vs. $Z_{2.5}$

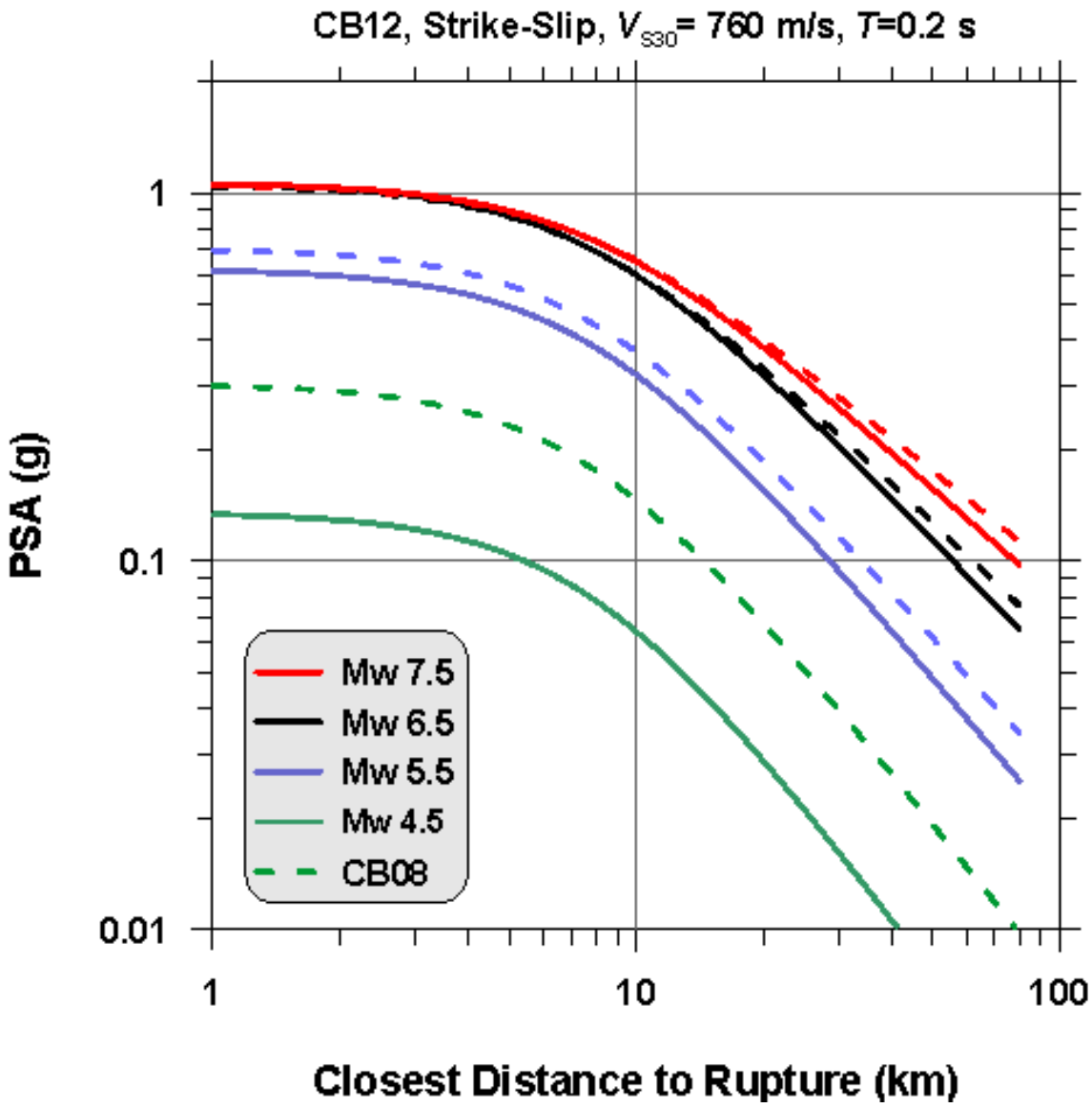


Comparison With 2008 NGA-West 1 GMPE

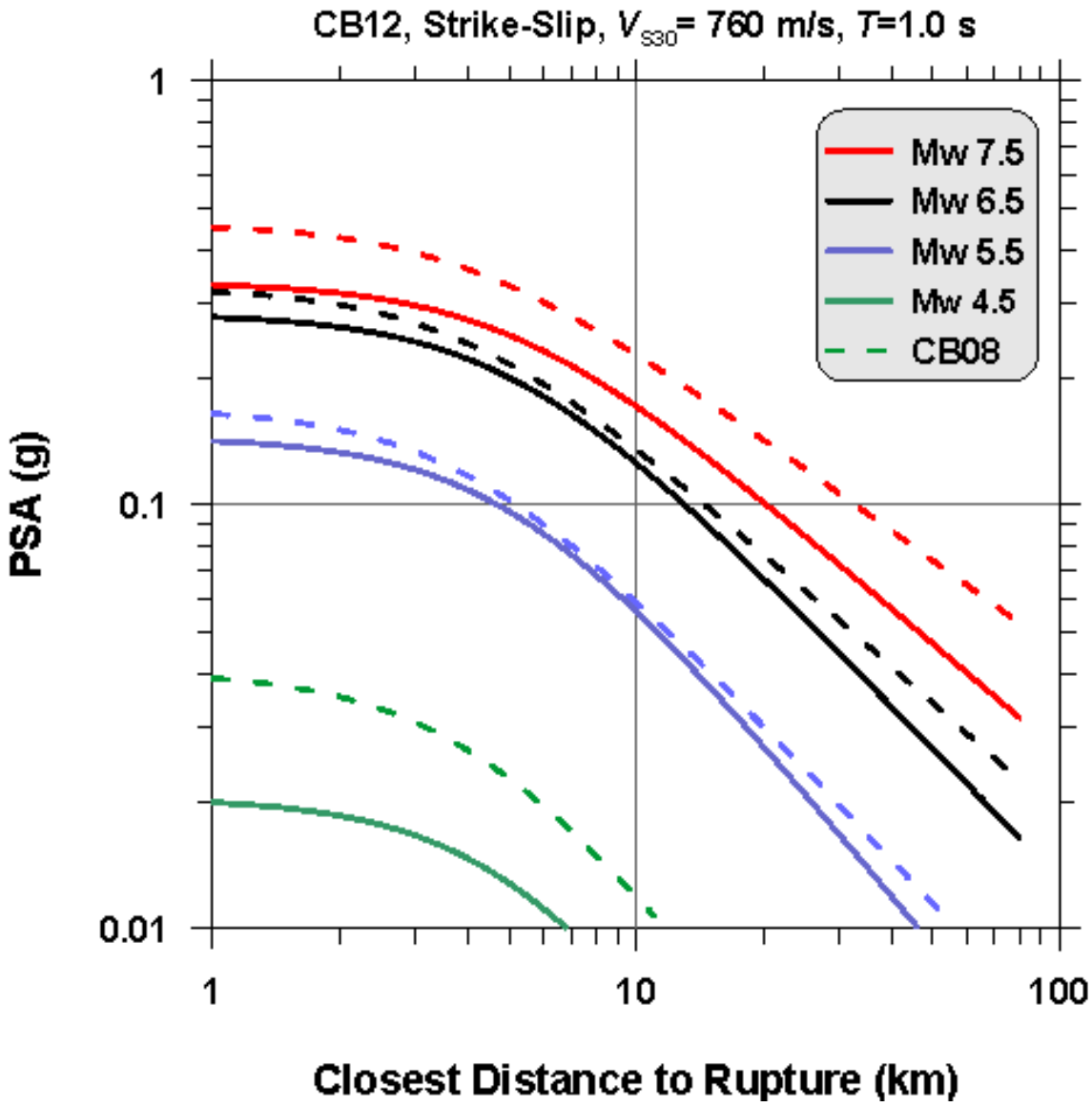
Strike Slip, Dip=90, V_{S30}=760



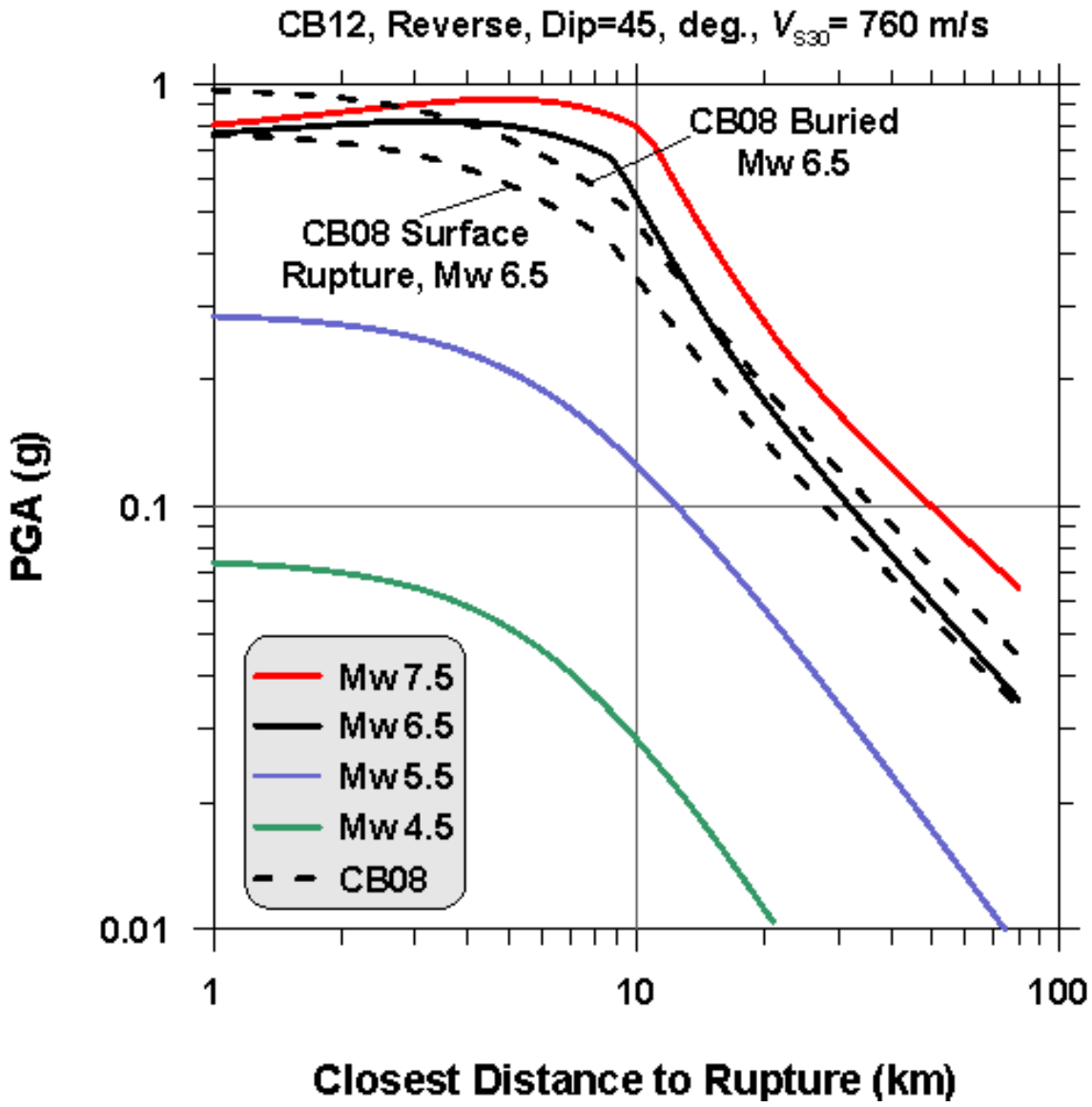
Strike Slip, Dip=90, V_{S30}=760



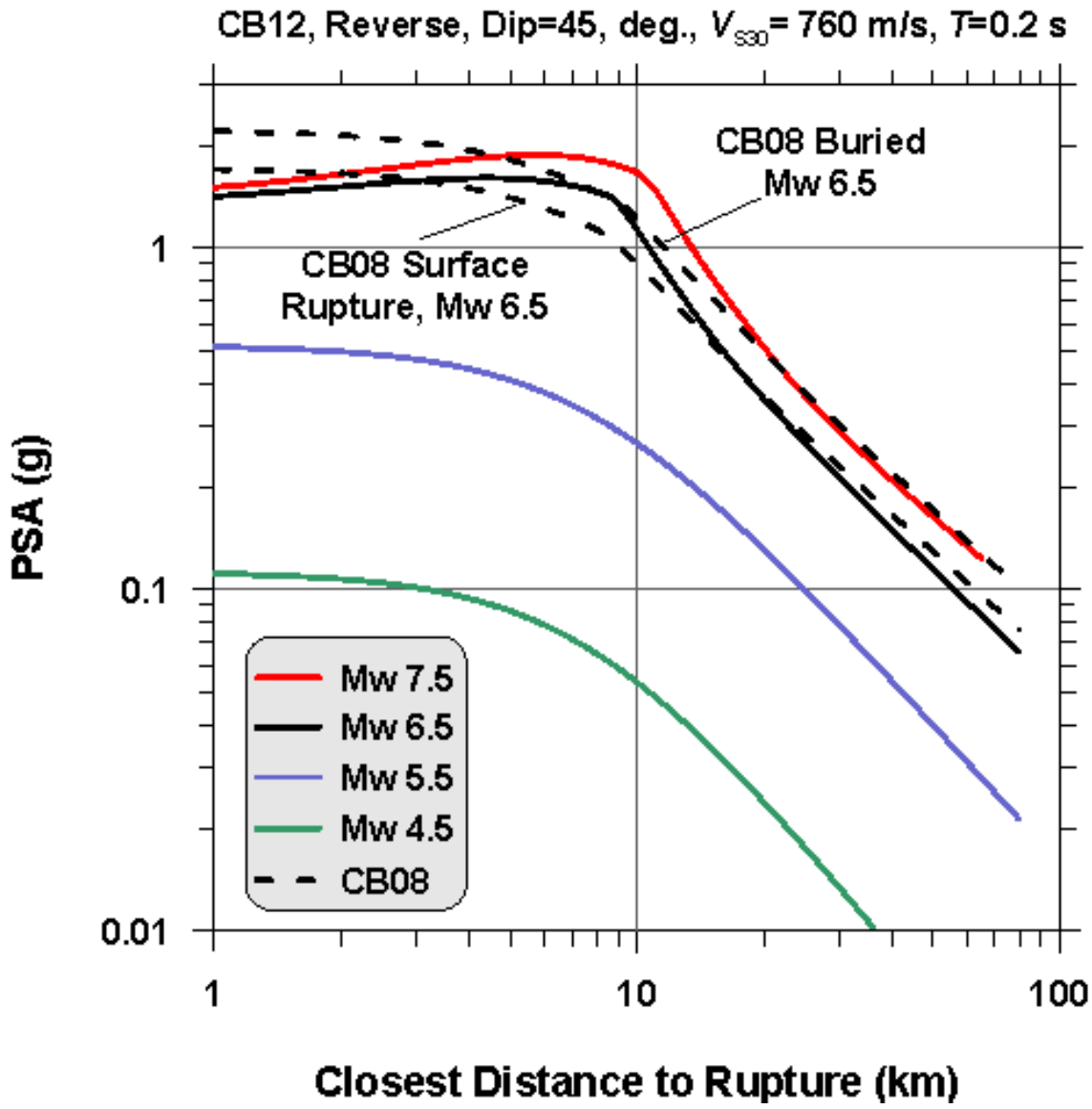
Strike Slip, Dip=90, V_{S30}=760



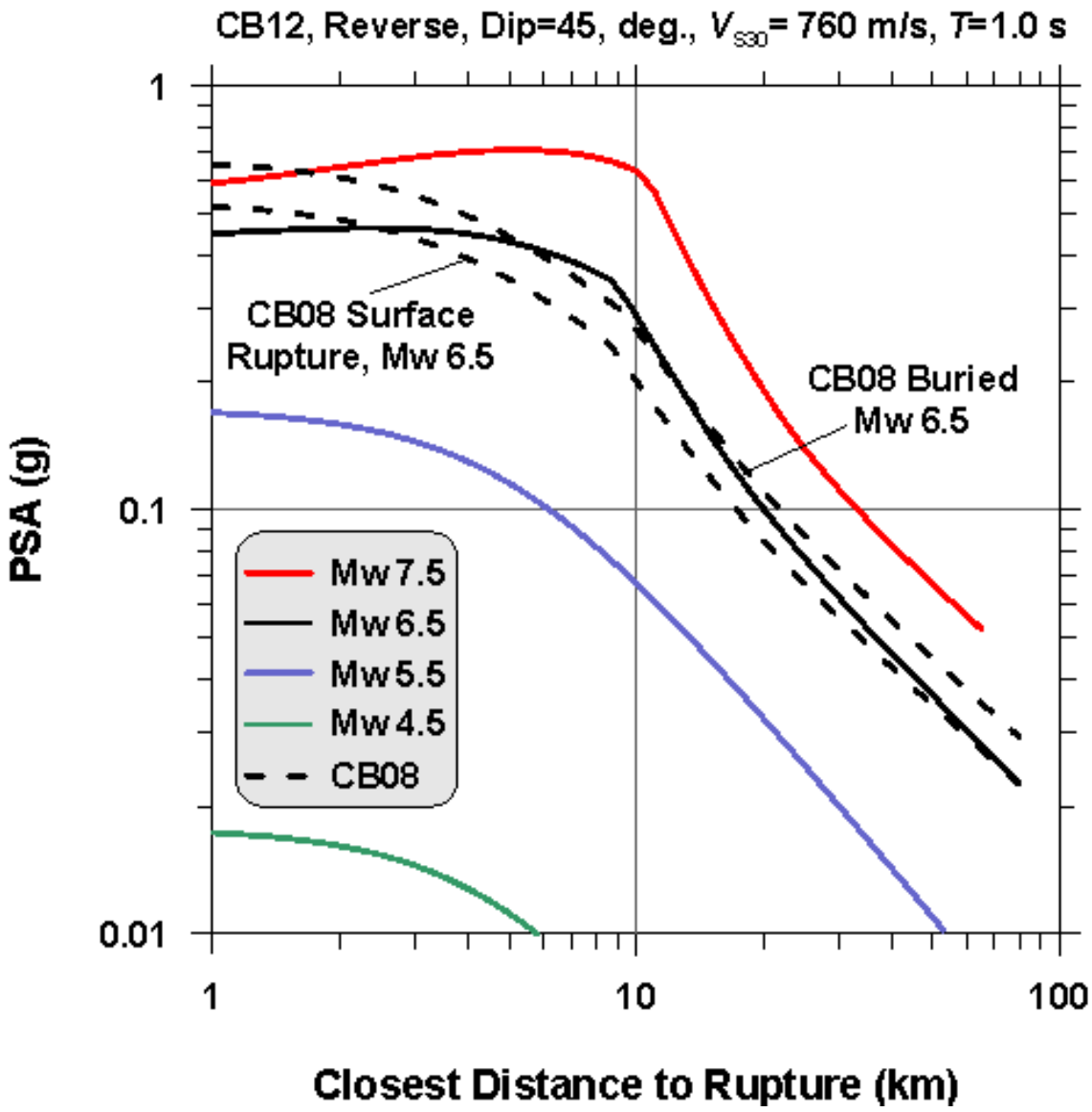
Reverse, HW, Dip=45, V_{S30}=760



Reverse, HW, Dip=45, V_{S30}=760



Reverse, HW, Dip=45, V_{S30}=760



Work to be Completed by Project End

Future Work

- Evaluate and include effects of directivity
- Evaluate new nonlinear site term
- Add regional anelastic attenuation terms
- Add additional spectral periods
- Magnitude-dependent standard deviation
- Develop vertical GMPE