

NGA-East Epistemic and Aleatory Uncertainties

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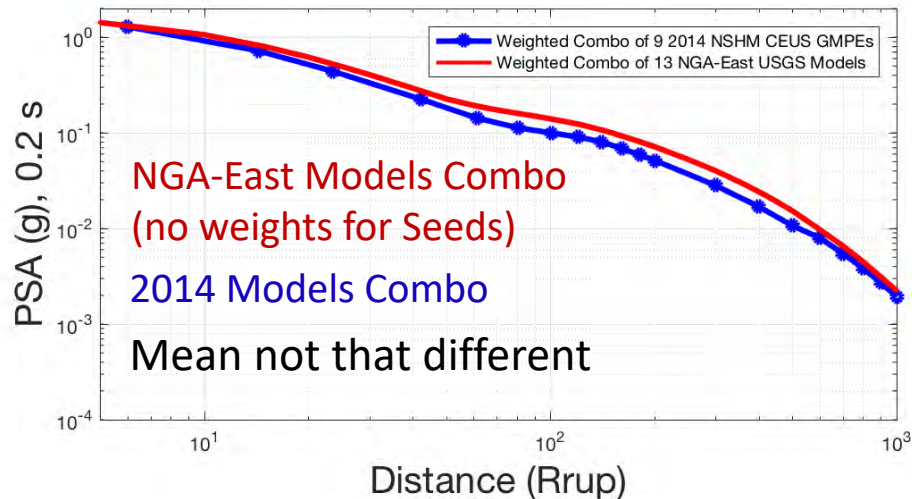
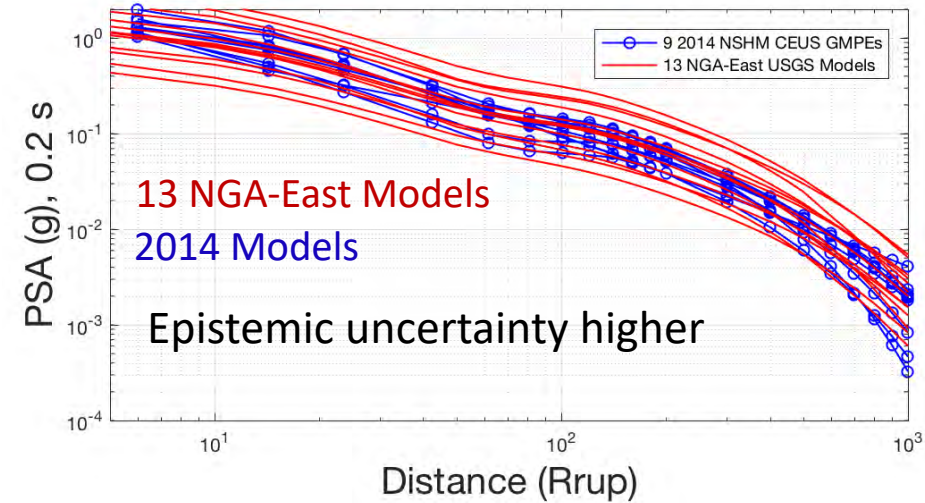
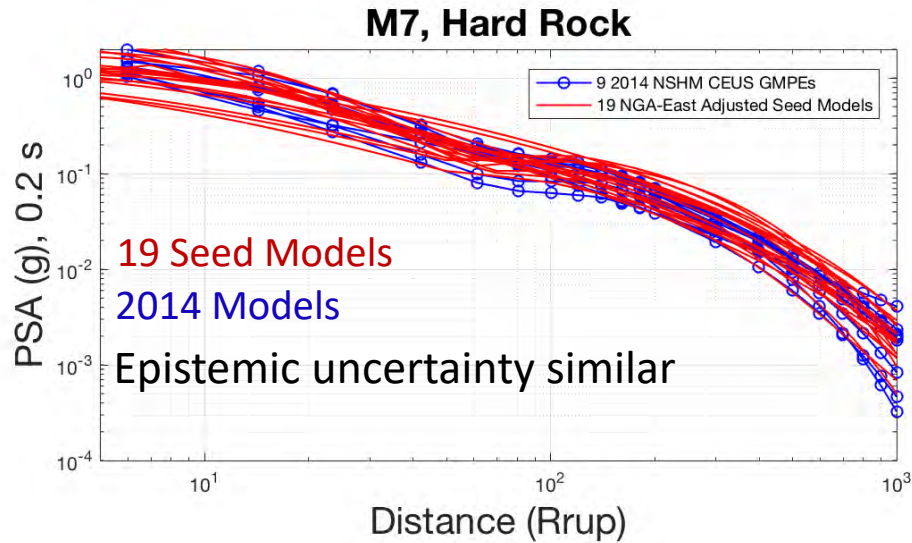
USGS, Golden, CO

USGS 2018 NSHM Update Workshop

Wednesday, March 7th, 2018

RMS Headquarters, Newark, CA

0.2 Sec Median GMMs

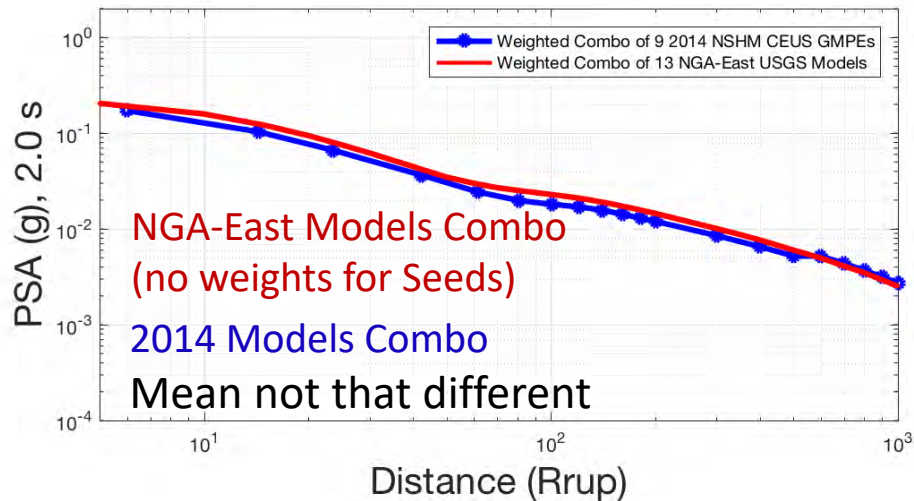
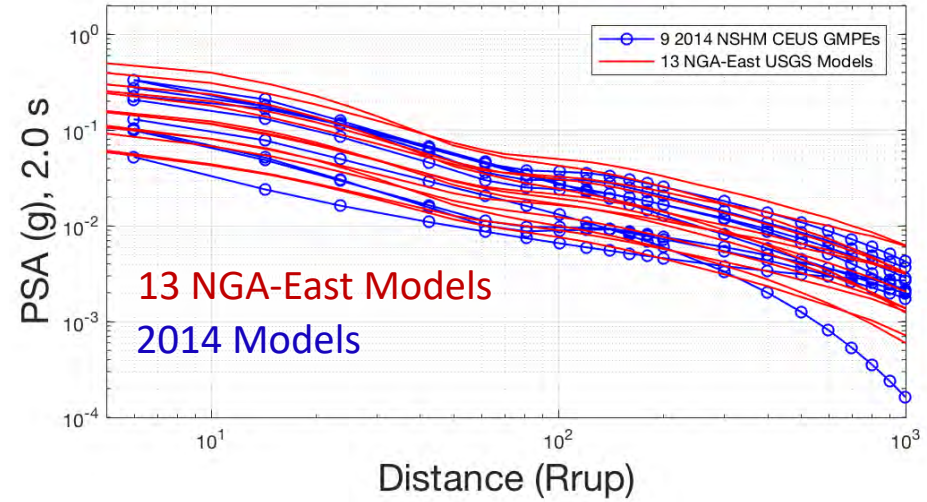
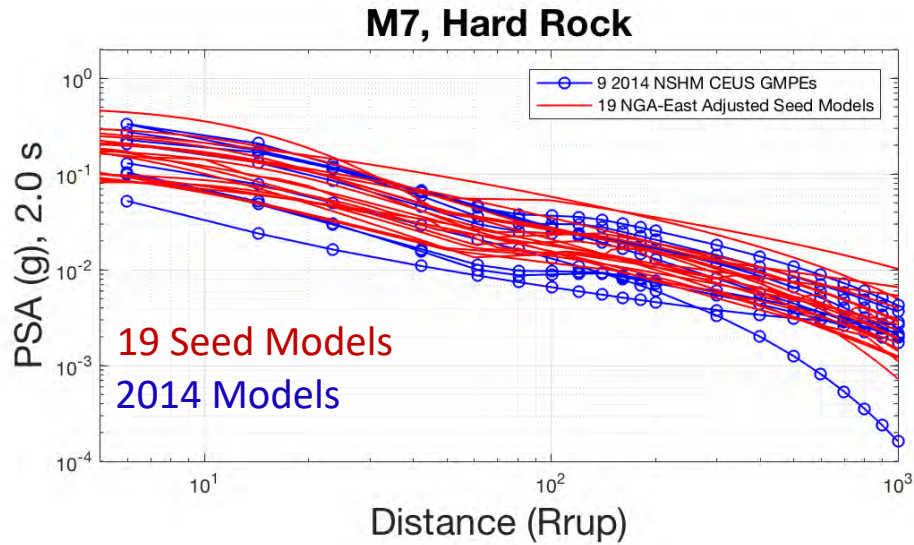


At short periods:

- **Mean:** The weighted mean not that different, slightly higher for large M, slightly lower at very long and very short distances
- **Epistemic uncertainty:** NGA-East Seed GMMs span the same range as the 2014 NSHM CEUS GMMs
- **Epistemic uncertainty:** NGA-East USGS GMMs* span a larger range than the 2014 NSHM CEUS GMMs

*NGA-East USGS GMMs are the GMMs presented in PEER Report 2017/03 (Goulet et al., 2017; NGA-East GMMs for the USGS NSHMs)

2 Sec Median GMMs



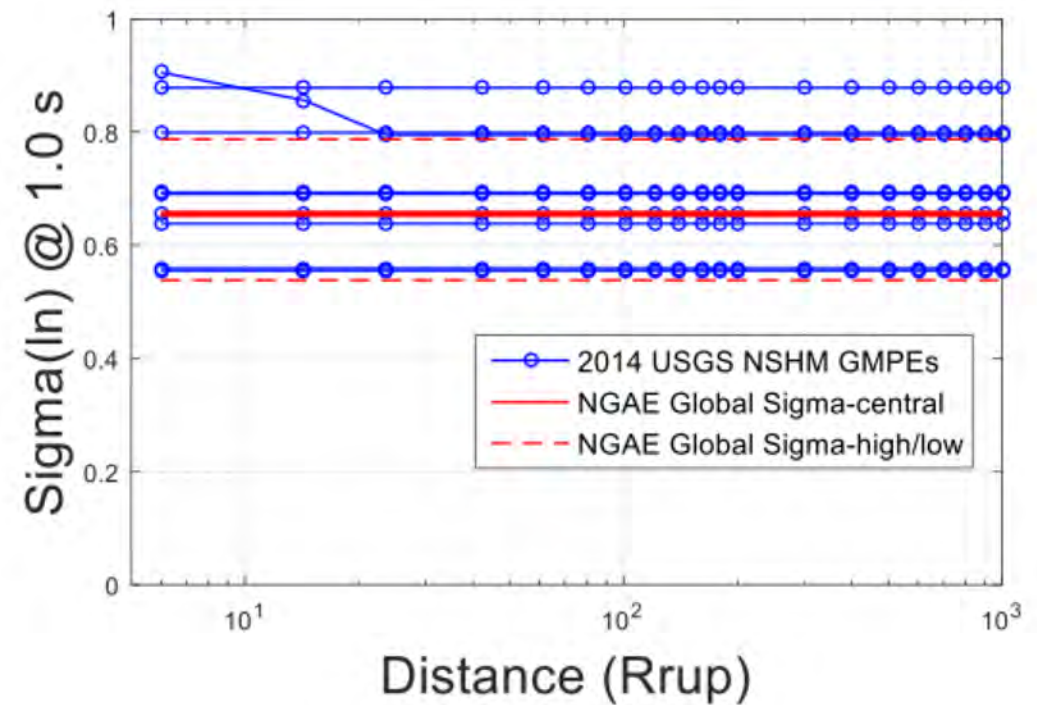
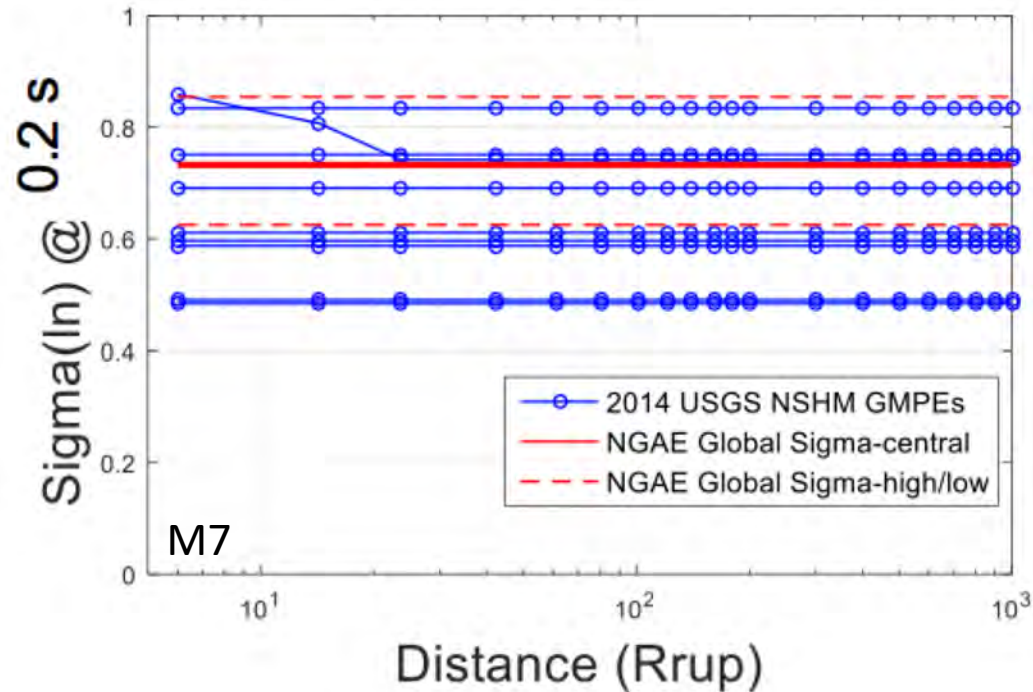
At long periods:

- **Mean:** The weighted mean not that different, slightly higher for large M, lower at very long and very short distances
- **Epistemic uncertainty:** Comparable but NGA-East USGS GMMs still span a larger range than the NGA-East Seed GMMs

Aleatory Uncertainty (not available for Seed Models)

Global Model

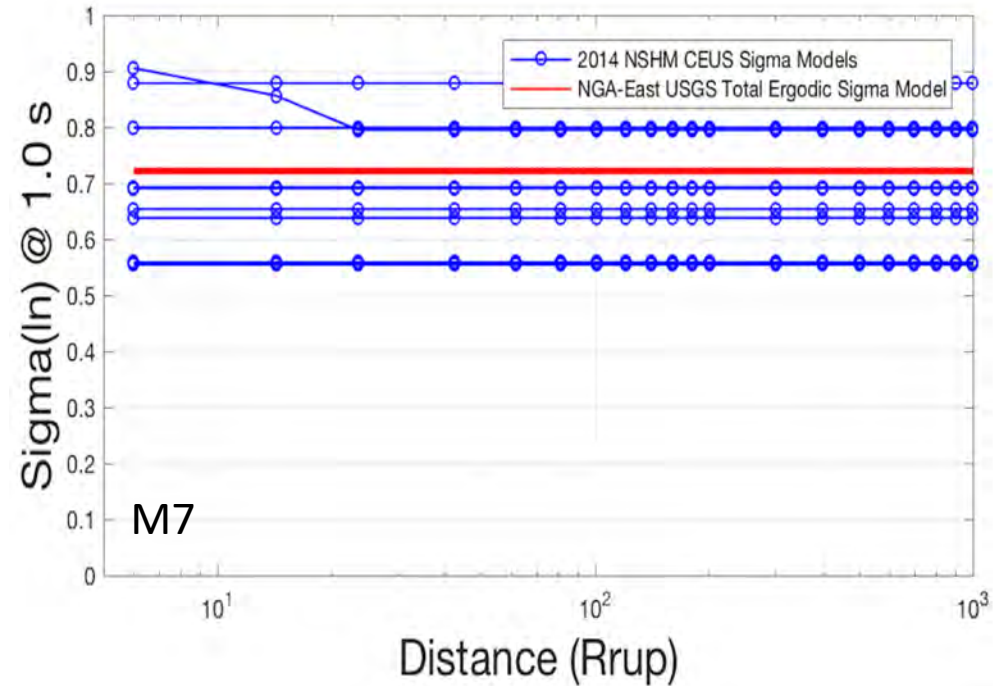
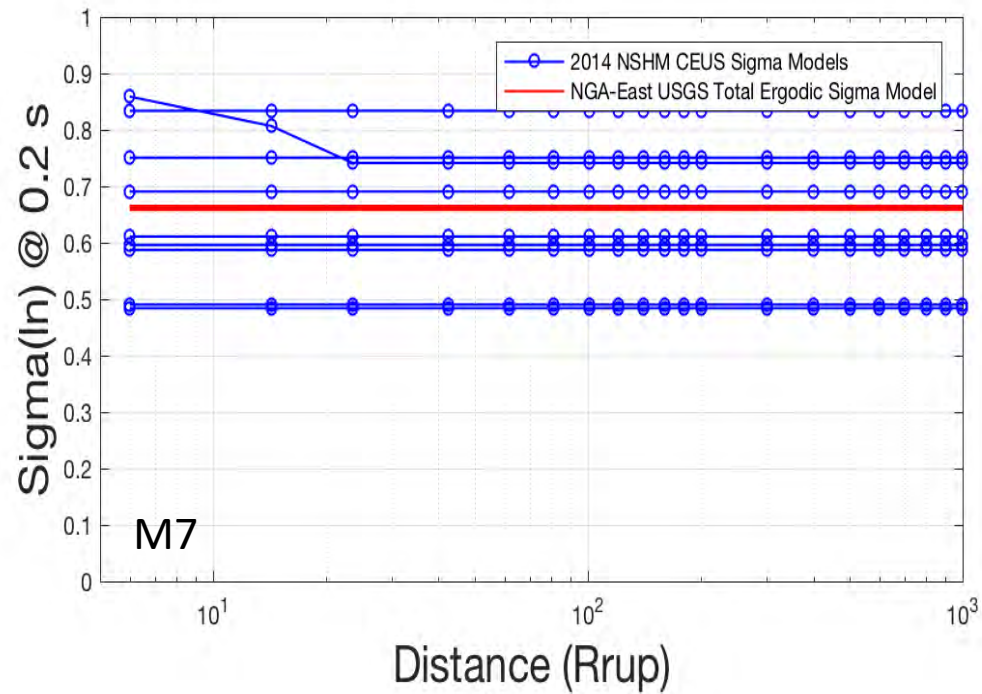
(original model from Al Atik and Youngs NGA-East report)



Increased Hazard!

Aleatory Uncertainty (not available for Seed Models)

Total Ergodic Sigma
(lowered based on WUS)



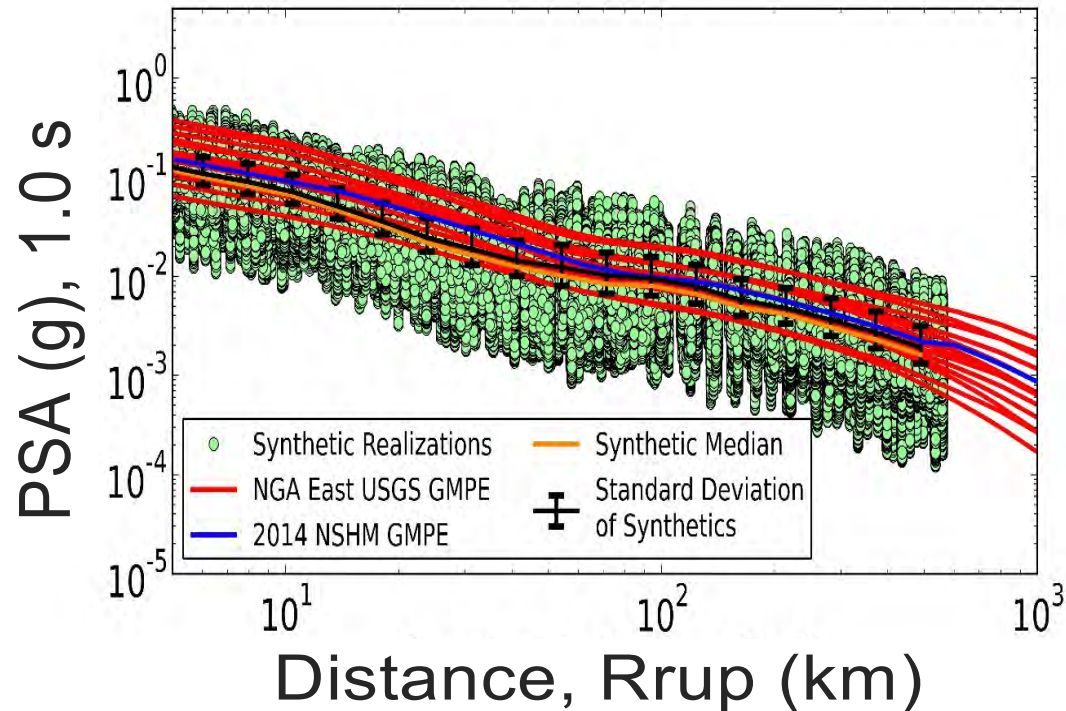
More Comparable

USGS Simulations

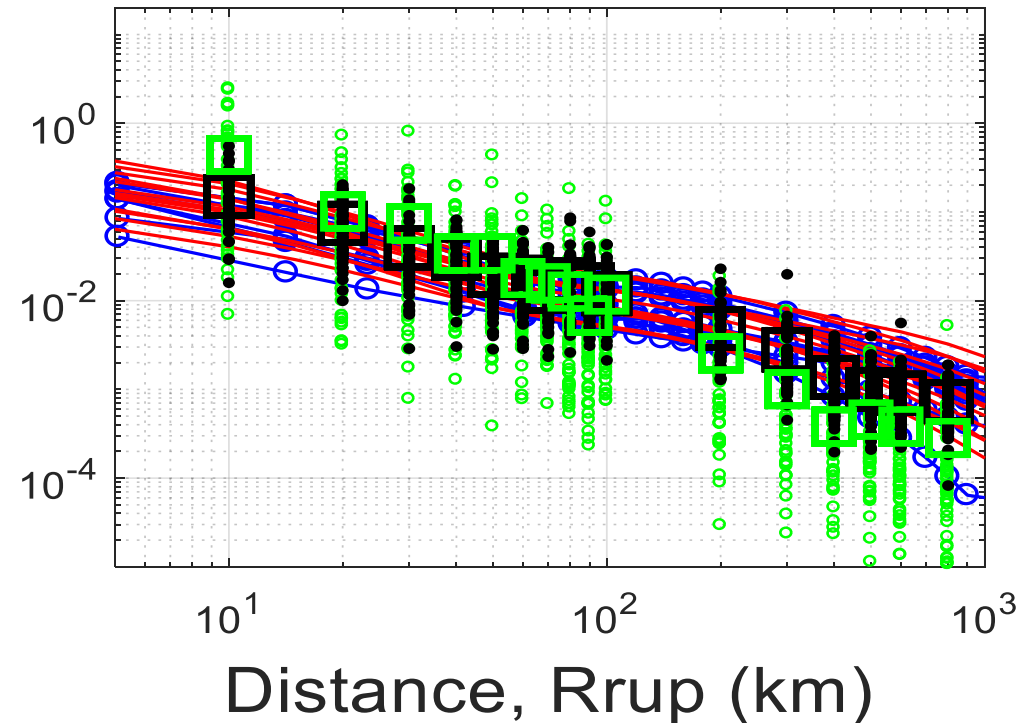
Simulations done for scenario magnitudes 6.0, 6.5, 7.0, 7.5, 8.0 for PGA, 0.2, 1, 2, 3, 5, 7.5 sec periods

M6 Example at 1.0 sec, compared to GMM means:

Physics-based simulations (Hartzell)



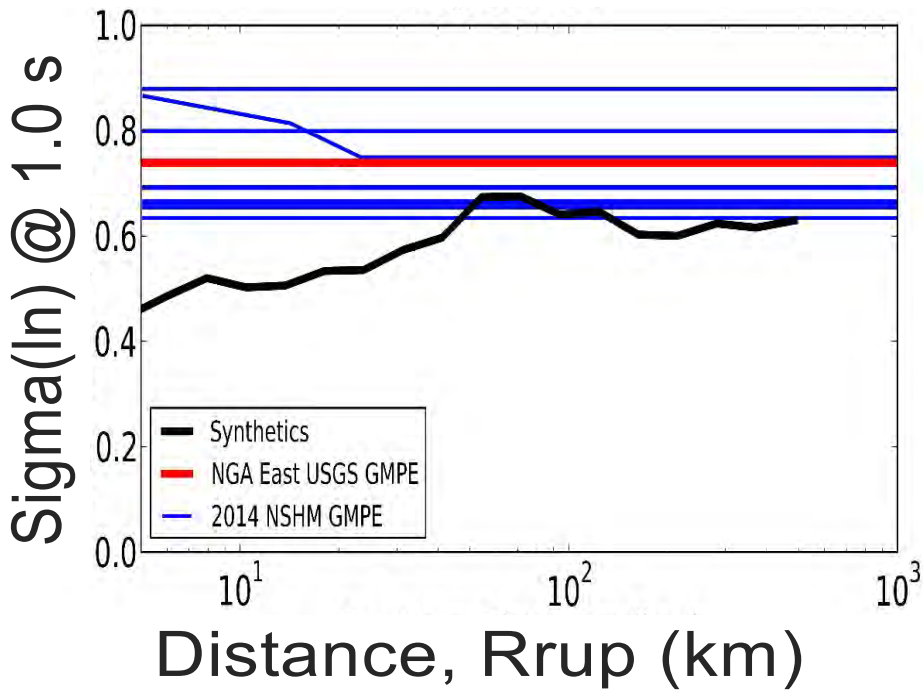
Stochastic simulations (Rezaeian)



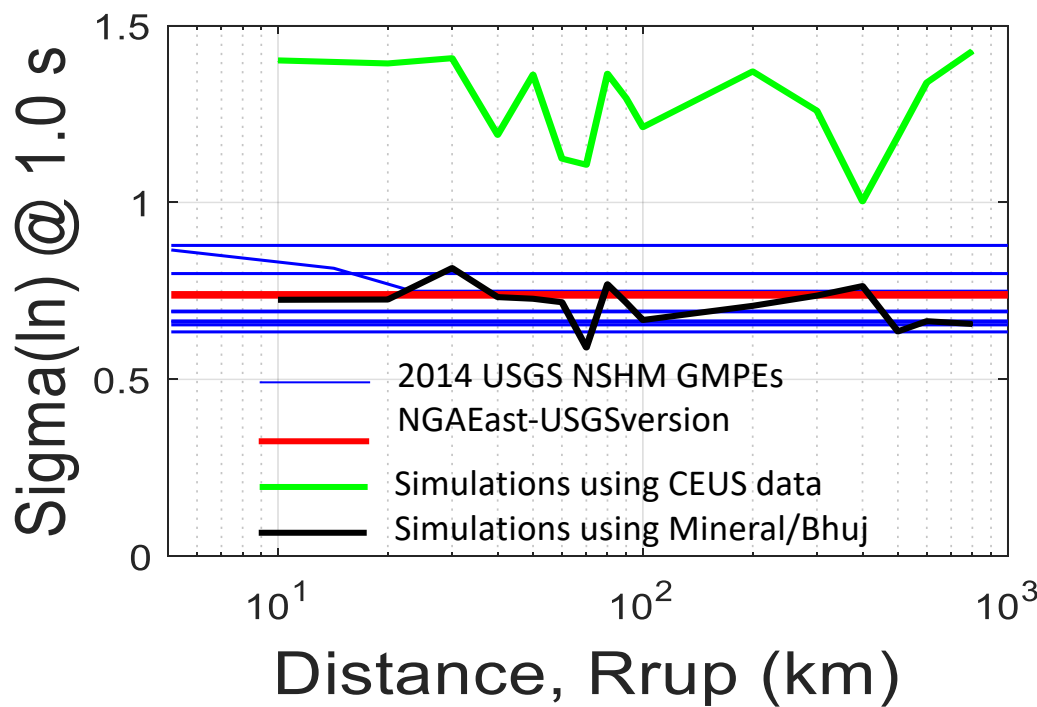
USGS Simulations

M6 Example at 1.0 sec sigma:

Physics-based simulations (Hartzell)



Stochastic simulations (Rezaeian)



Summary

- **Weighted Mean:** Almost the same as 2014, slightly higher for large M, lower at very long and very short distances
- **Epistemic Uncertainty:** Larger for NGA-East USGS GMMs
Issue: Weights not available for Seed Models
- **Aleatory Uncertainty:** Comparable to 2014, but less than original model, and simulations suggest it could be higher.
Issue: Not available for Seed Models