Proposed 2018 NSHM CEUS GMMs (cont.)

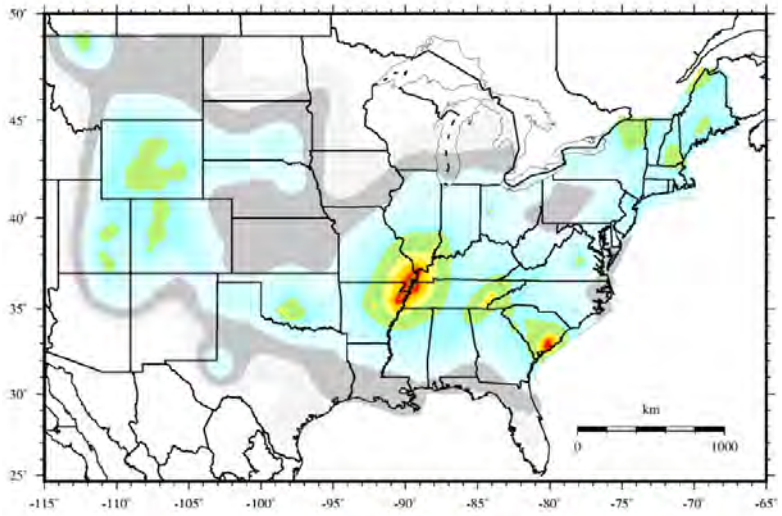
Sensitivity Studies

Presented by Allison Shumway
USGS, Golden, CO
USGS 2018 NSHM Update Workshop
Wednesday, March 7th, 2018
RMS Headquarters, Newark, CA

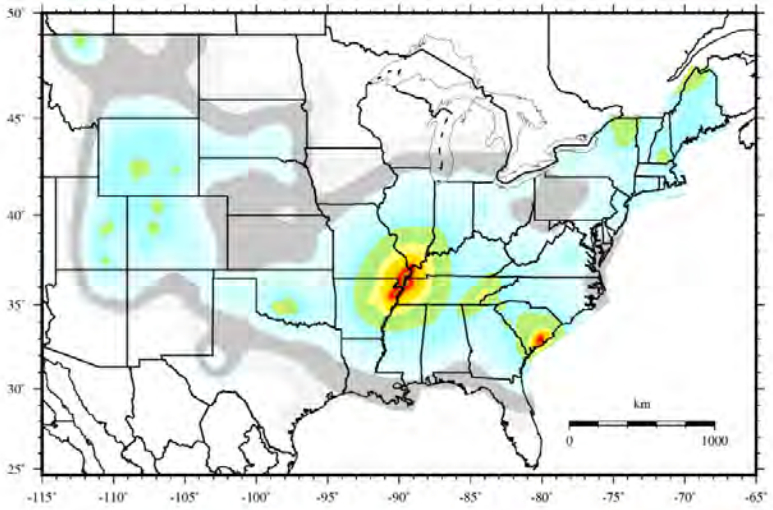
U.S. Department of the Interior
U.S. Geological Survey

0.2 Second Total Mean Hazard Comparison (2% in 50 years, uniform hazard rock site)

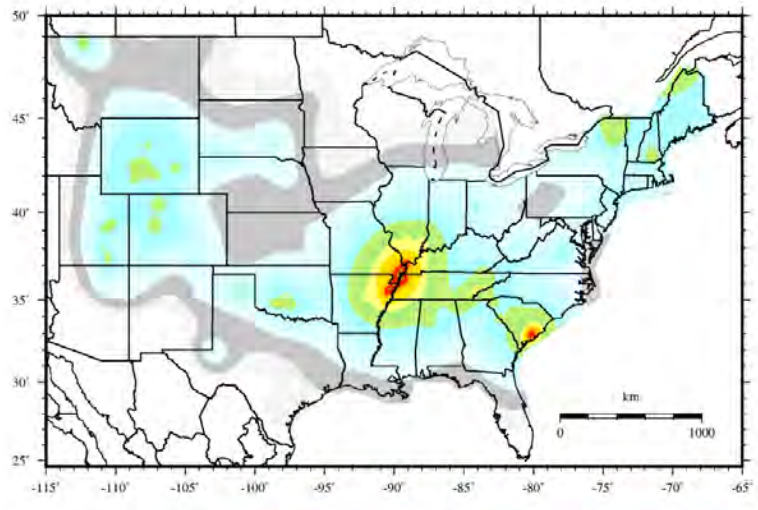
2014 NSHM



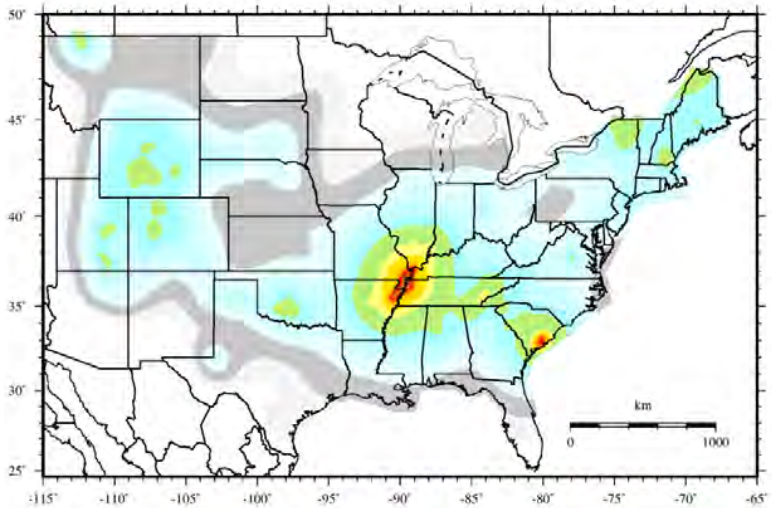
NGA-East USGS



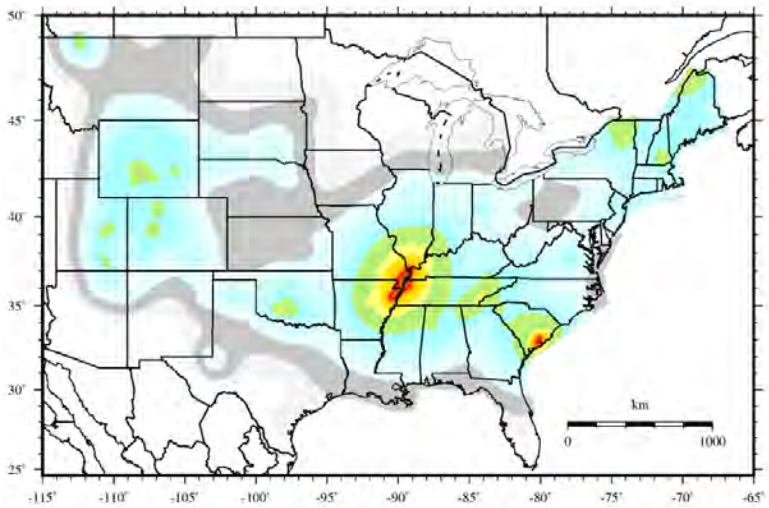
Updated NGA-East Seeds (LT #1)

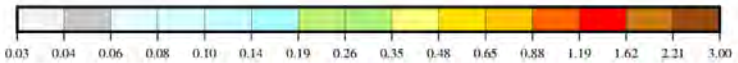


Updated NGA-East Seeds (LT #2)



Proposed 2018 NSHM*



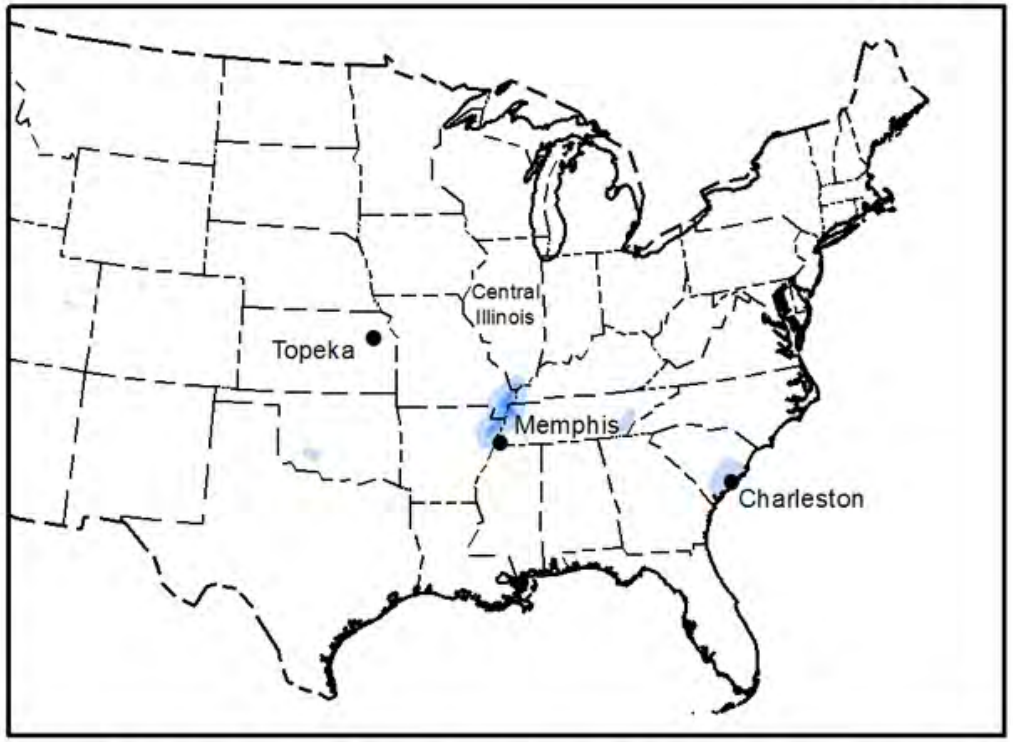


0.2 Second Spectral Acceleration (g)

* Proposed 2018 NSHM is Updated NGA-East Seed GMMs (LT#2) with 50% weight and NGA-East USGS GMMs with 50% weight

0.2 Second Total Mean Hazard Comparison

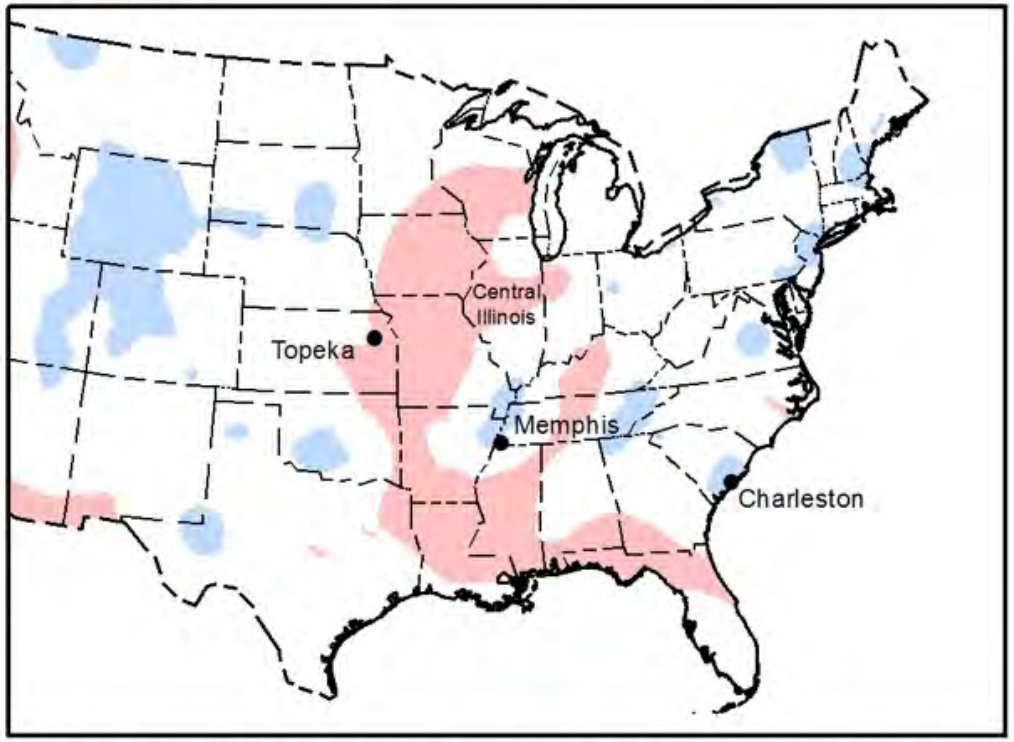
Updated NGA-East Seed GMMs
(logic tree 1) – (logic tree 2)



Difference (*g*)

-0.5 -0.1 -0.05 -0.01 0.01 0.05 0.1 0.5

Updated NGA-East Seed GMMs
(logic tree 1)/(logic tree 2)

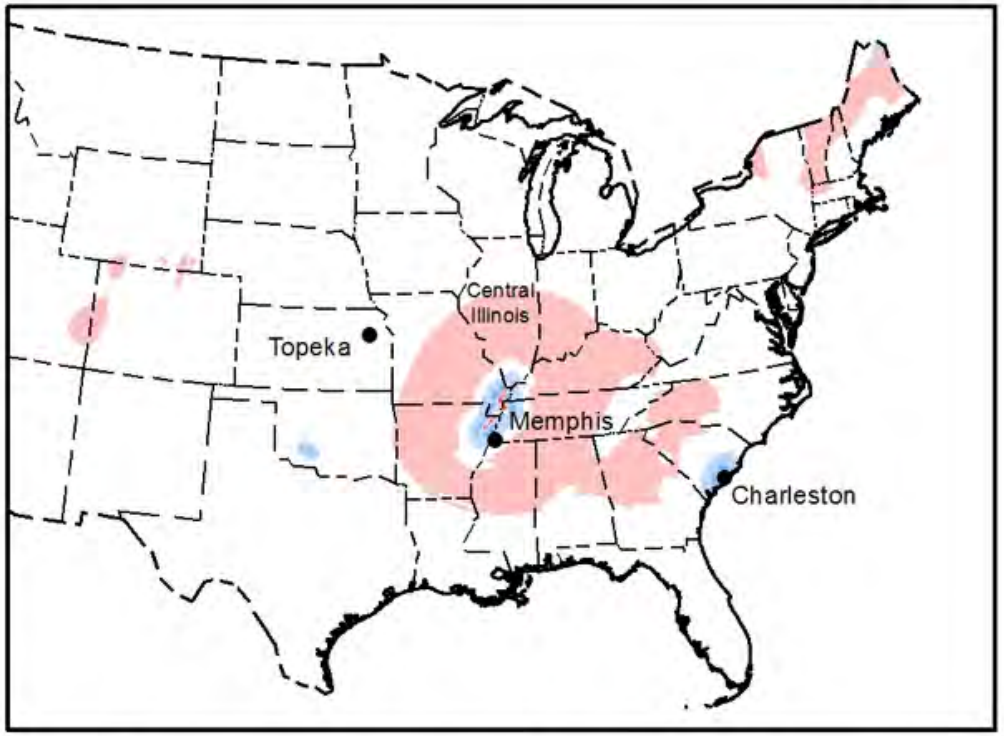


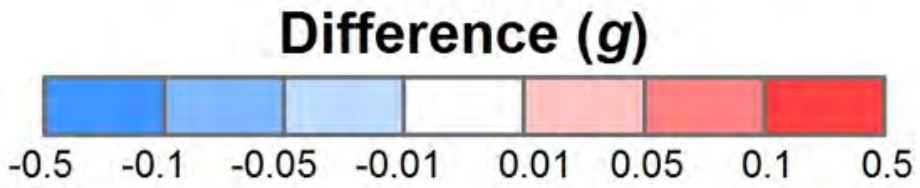
Ratio

0.67 0.8 0.9 0.98 1.02 1.1 1.25 1.5

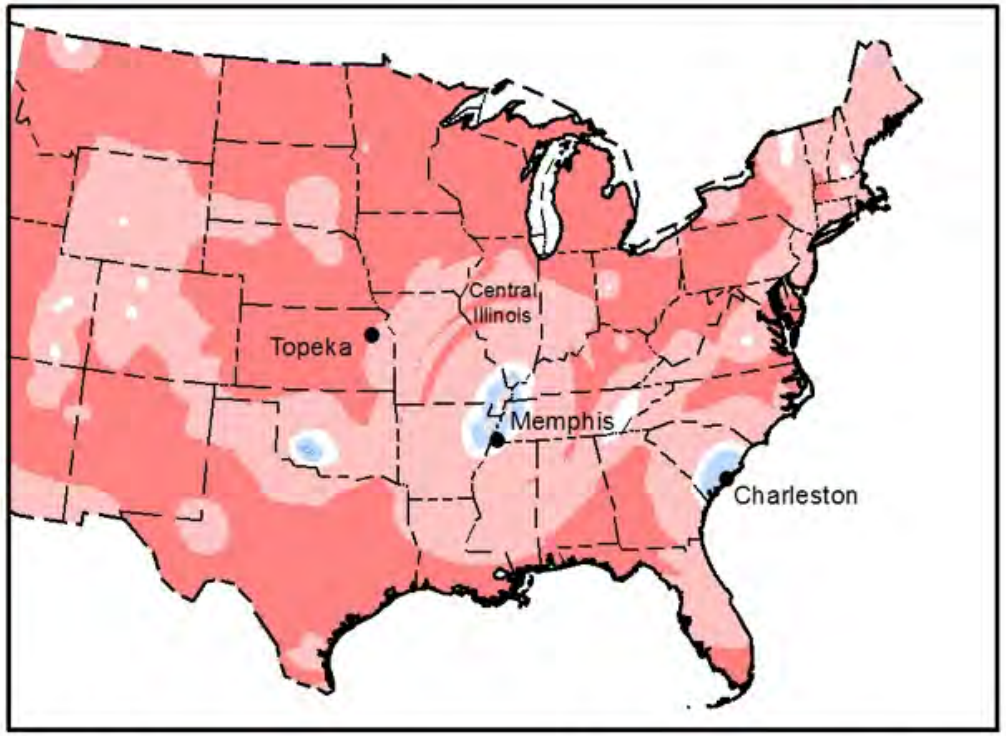
0.2 Second Total Mean Hazard Comparison

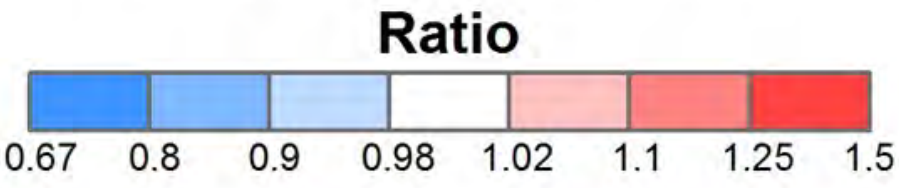
(Updated NGA-East Seed GMMs: logic tree 1) – (NGA-East USGS GMMs)





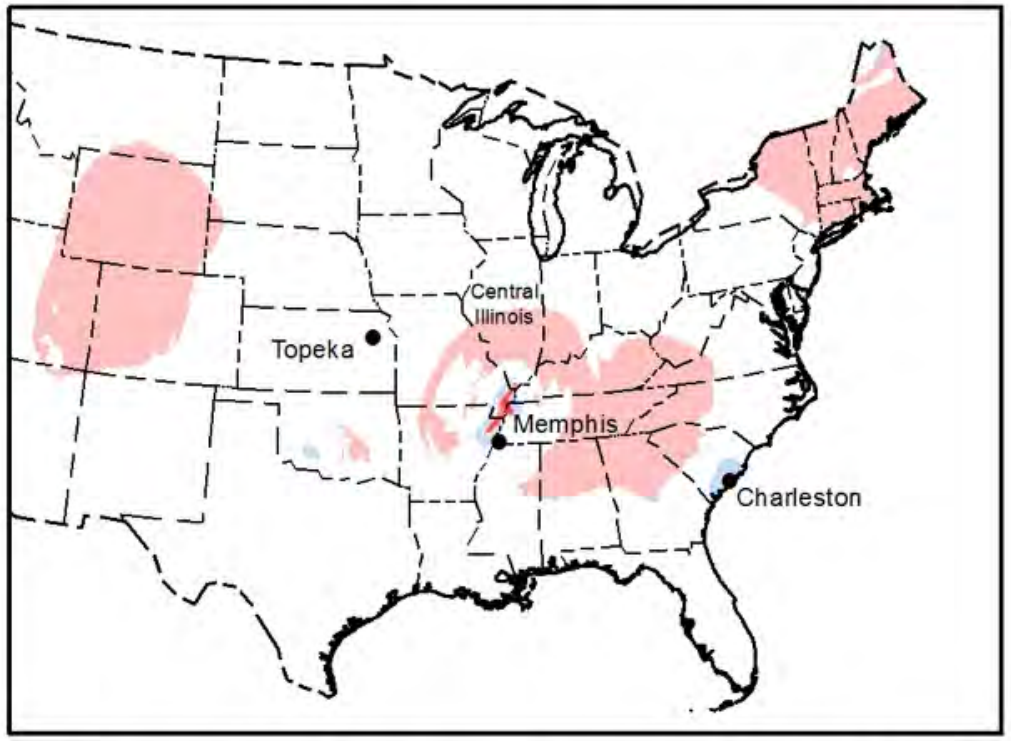
(Updated NGA-East Seed GMMs: logic tree 1) / (NGA-East USGS GMMs)

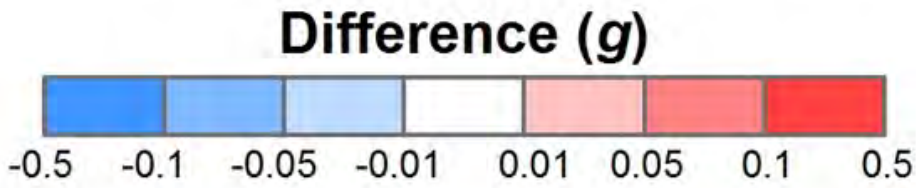




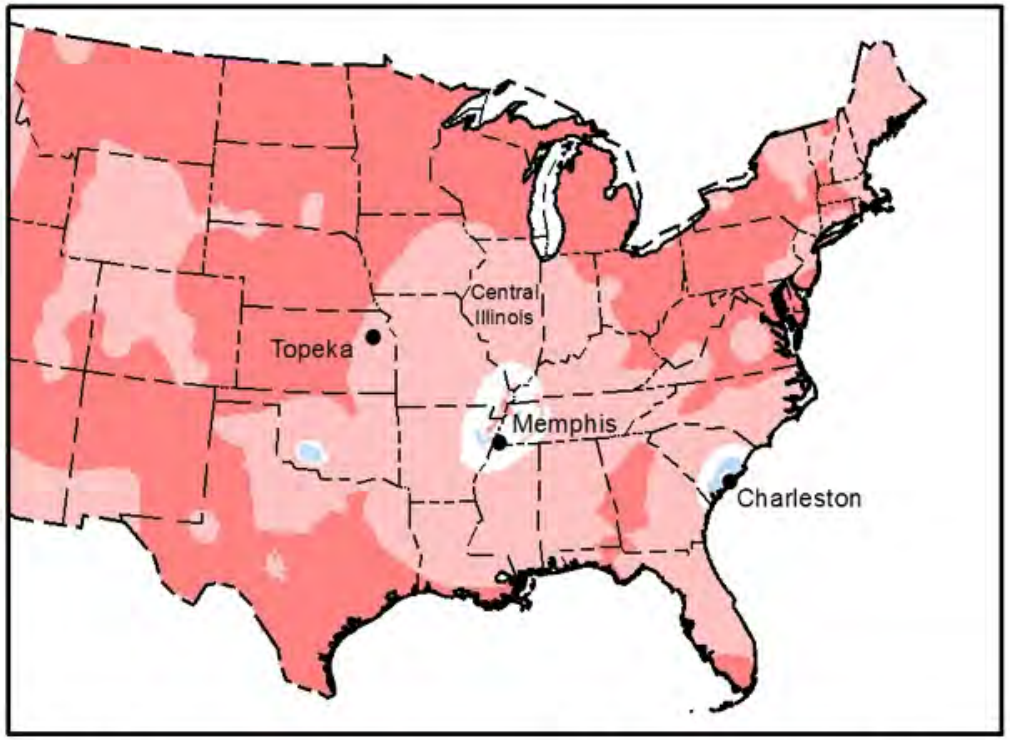
0.2 Second Total Mean Hazard Comparison

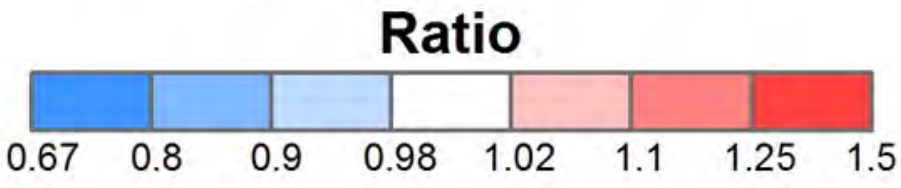
(Updated NGA-East Seed GMMs: logic tree 2) – (NGA-East USGS GMMs)





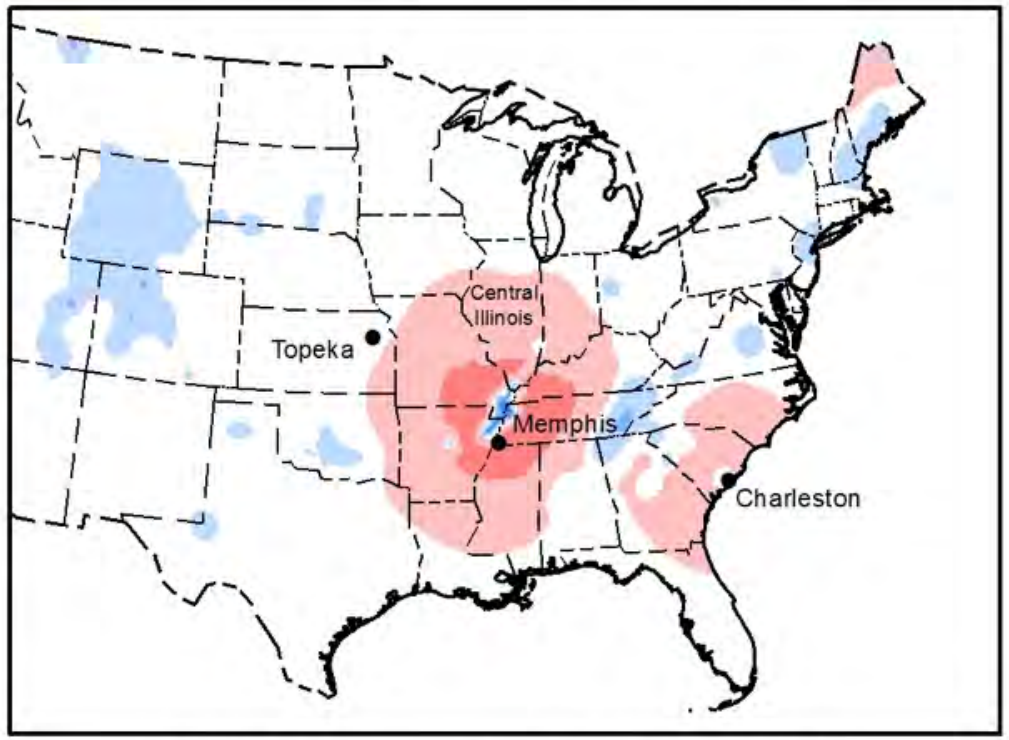
(Updated NGA-East Seed GMMs: logic tree 2) / (NGA-East USGS GMMs)





0.2 Second Total Mean Hazard Comparison

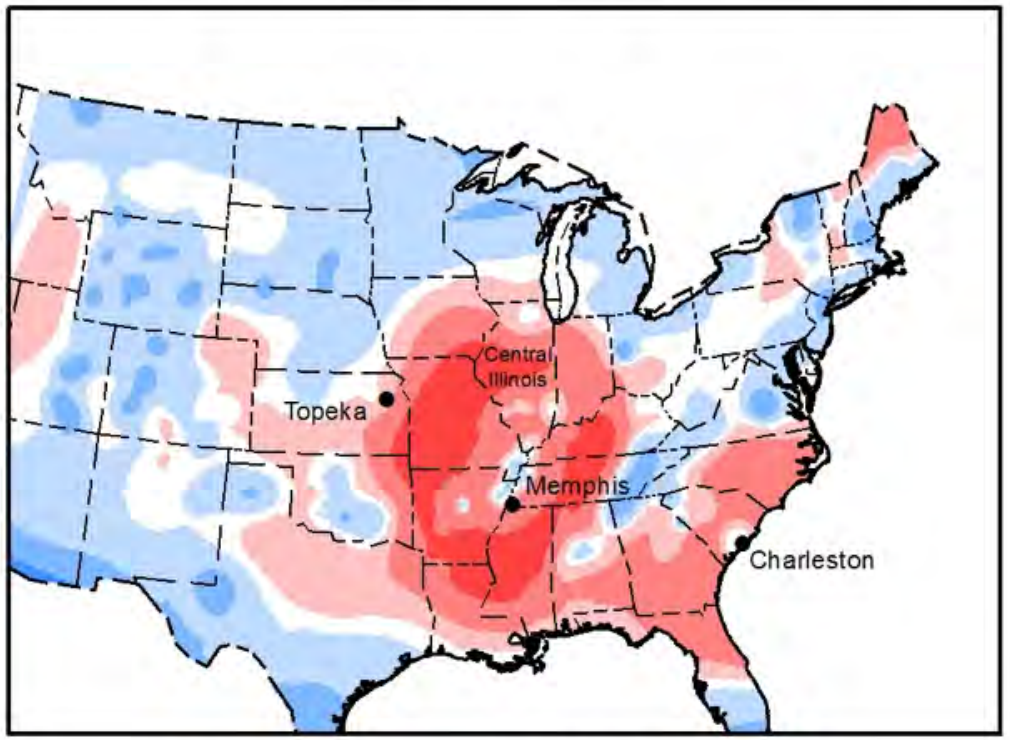
(Proposed 2018 NSHM) – (2014 NSHM)



Difference (*g*)

-0.5 -0.1 -0.05 -0.01 0.01 0.05 0.1 0.5

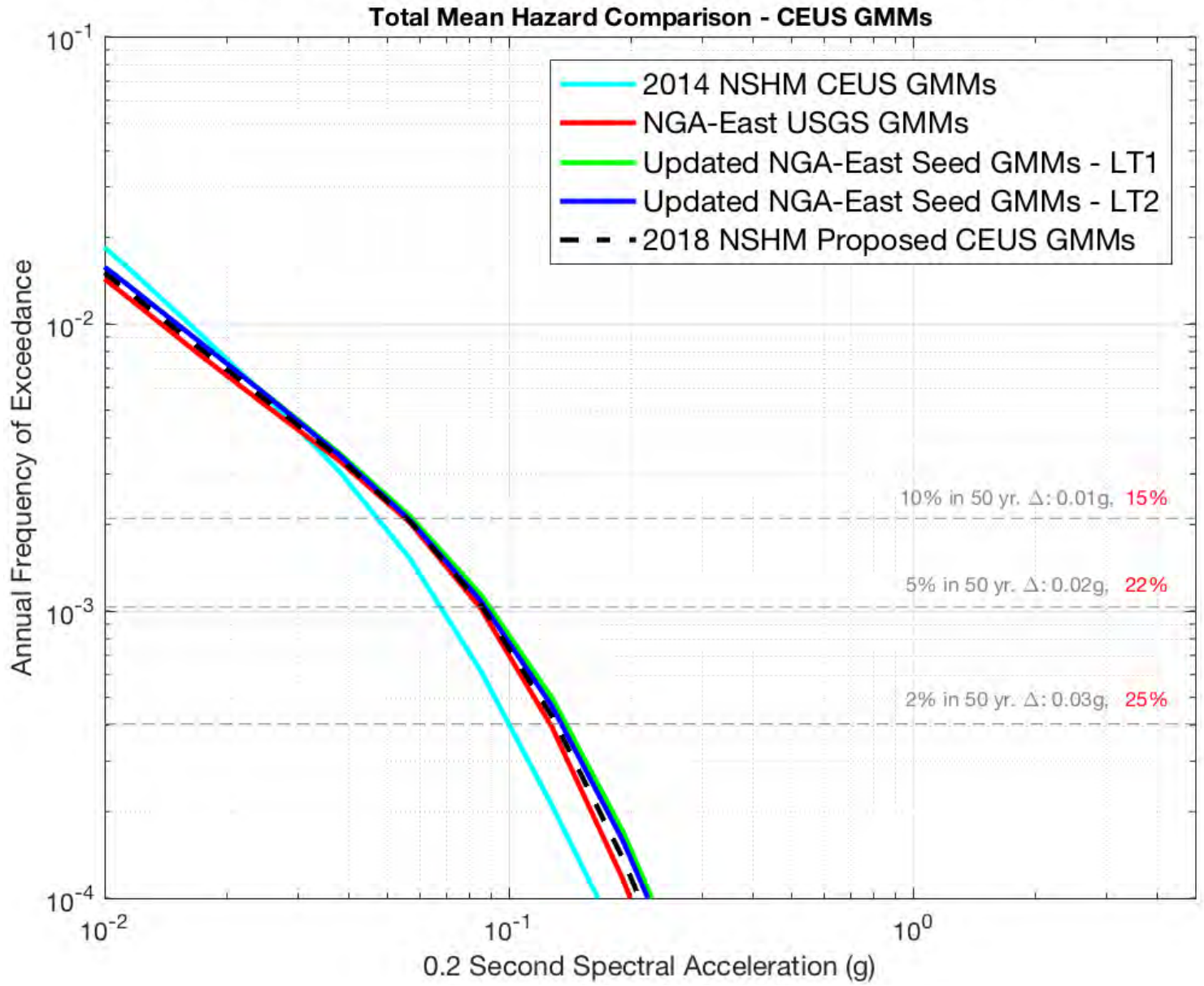
(Proposed 2018 NSHM) / (2014 NSHM)



Ratio

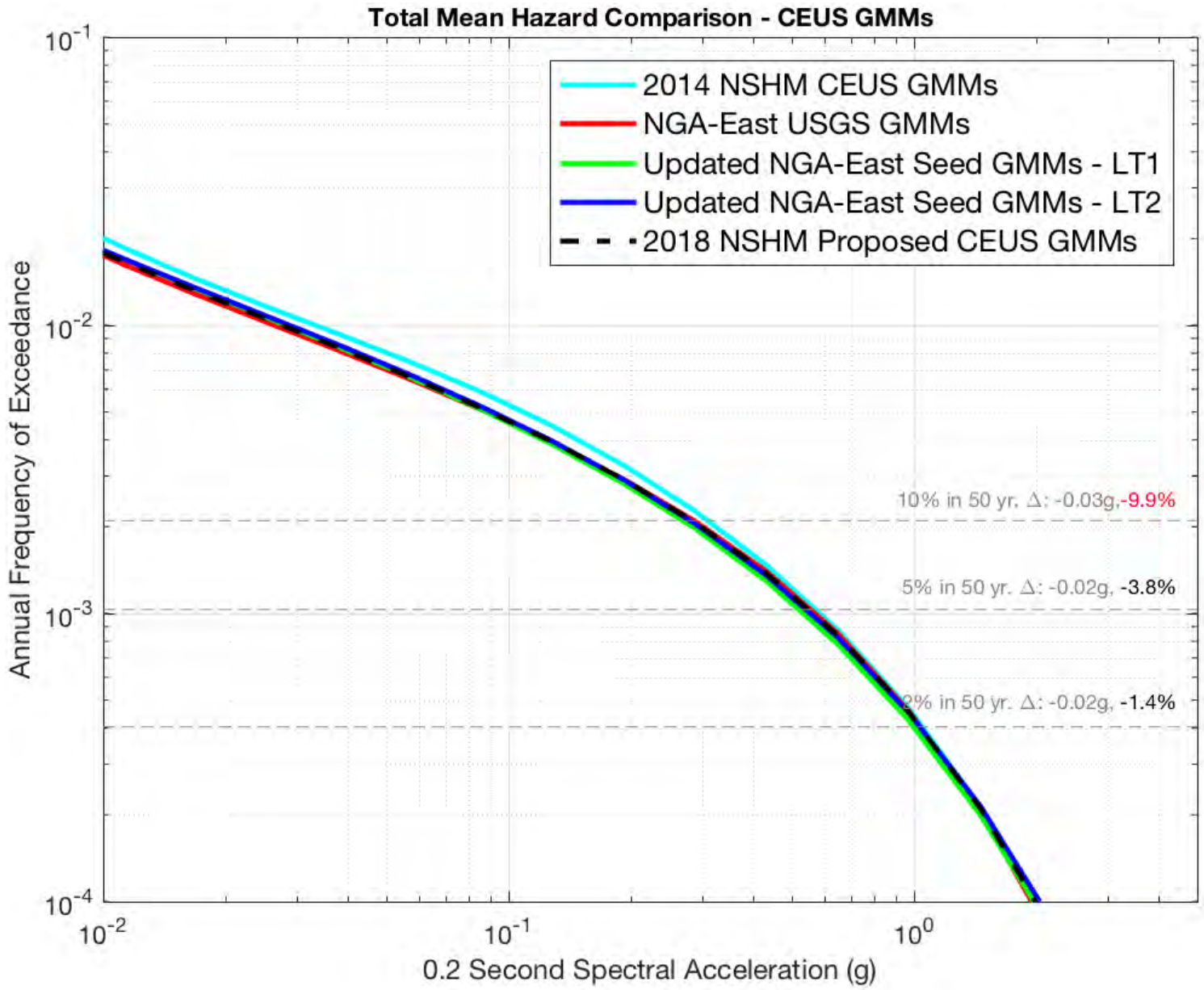
0.67 0.8 0.9 0.98 1.02 1.1 1.25 1.5

Hazard Curves: Central Illinois, IL

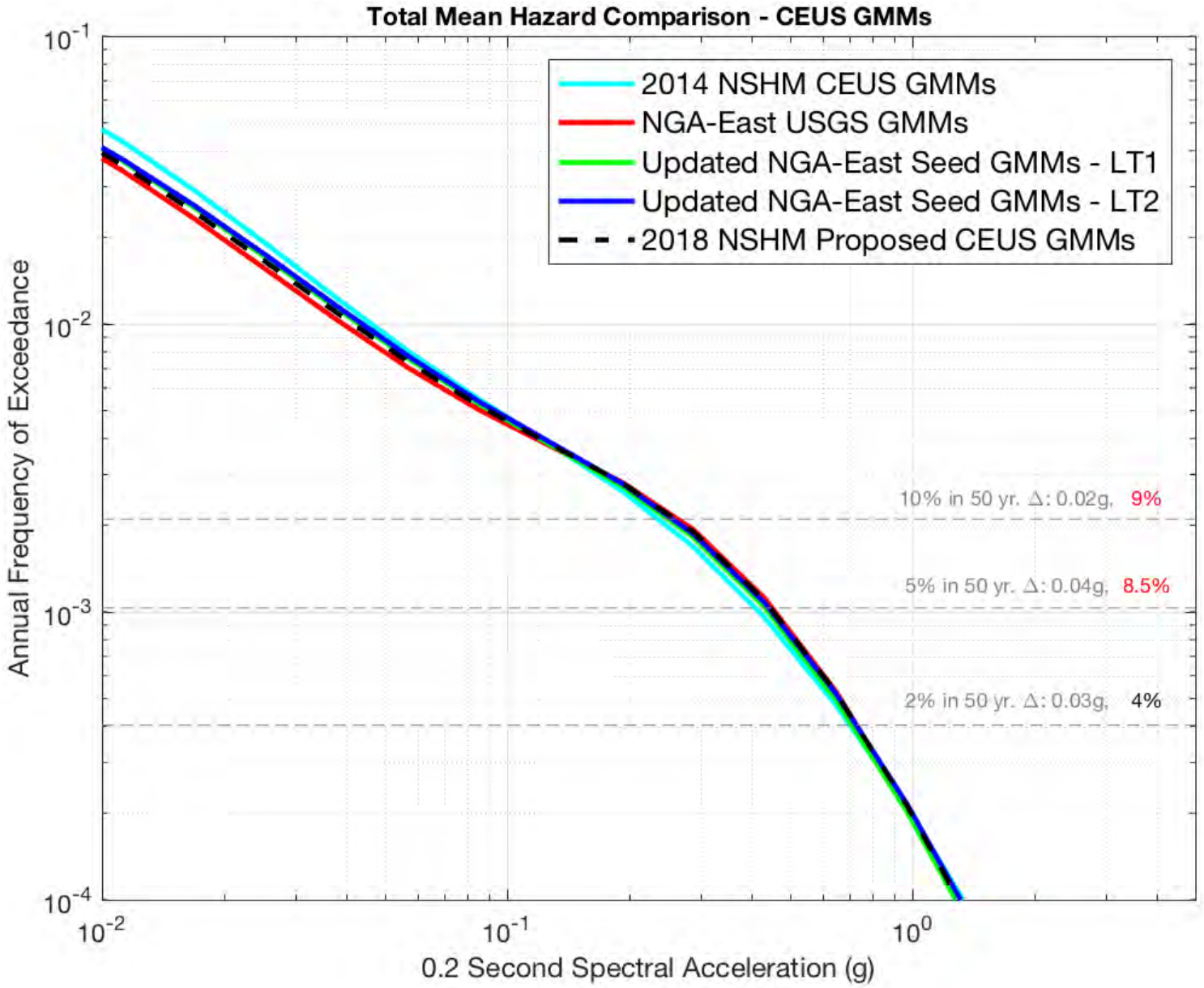


Note: Percent difference is Proposed 2018 NSHM vs. 2014 NSHM

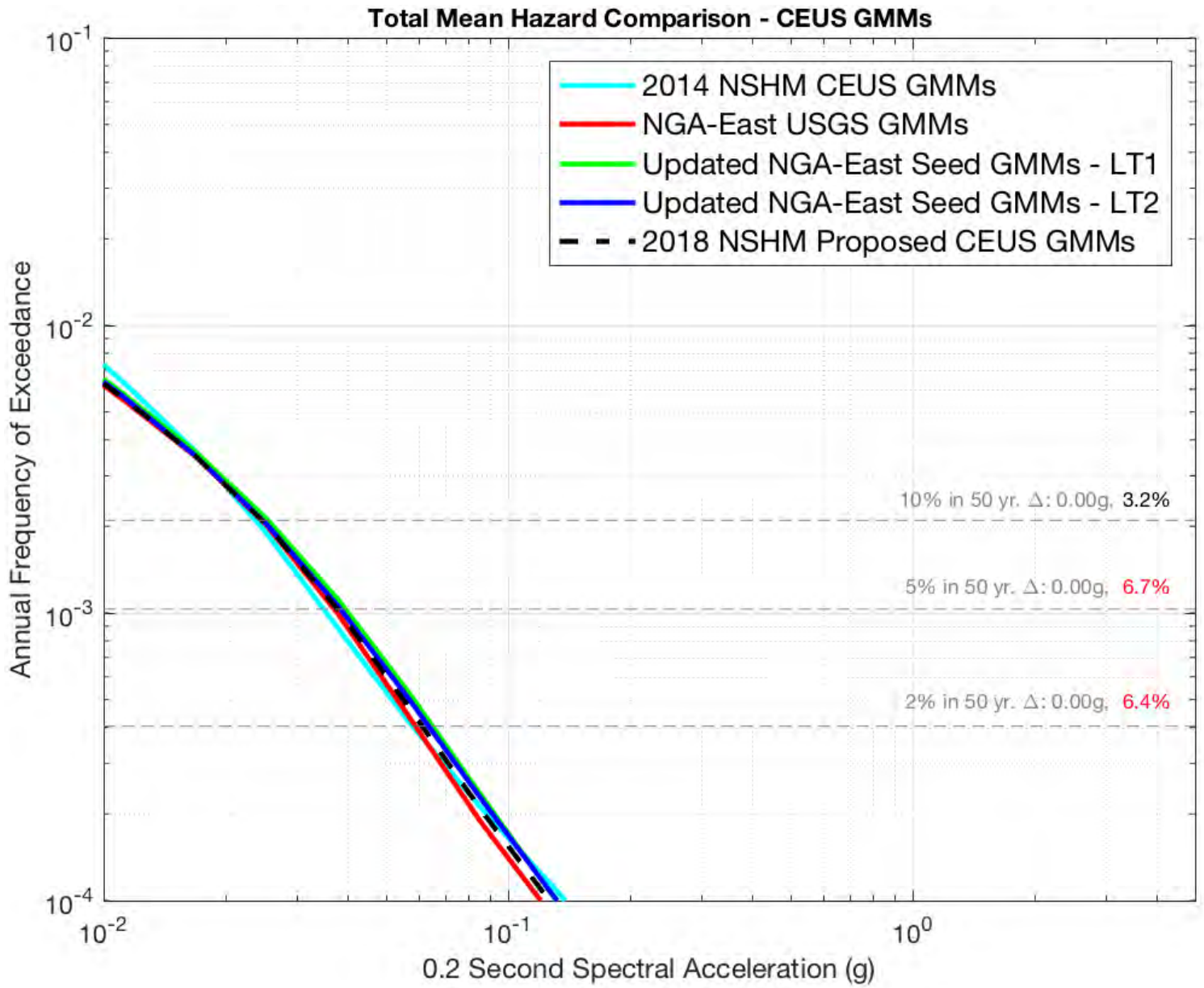
Hazard Curves: Charleston, SC



Hazard Curves: Memphis, TN

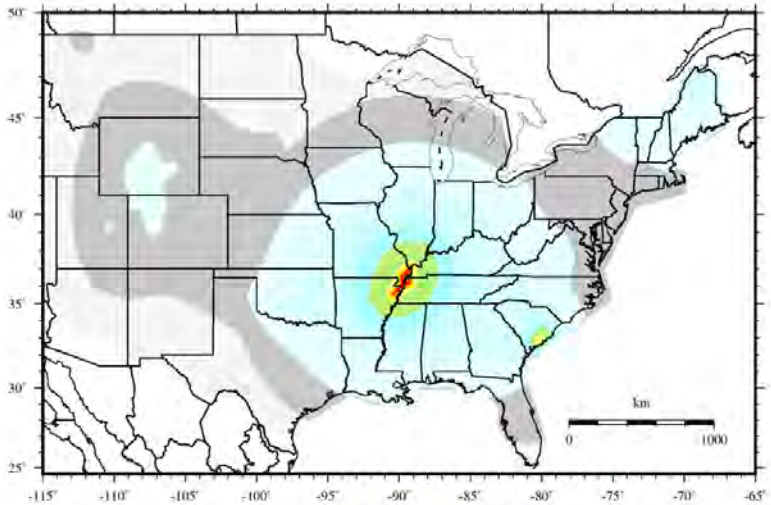


Hazard Curves: Topeka, KS

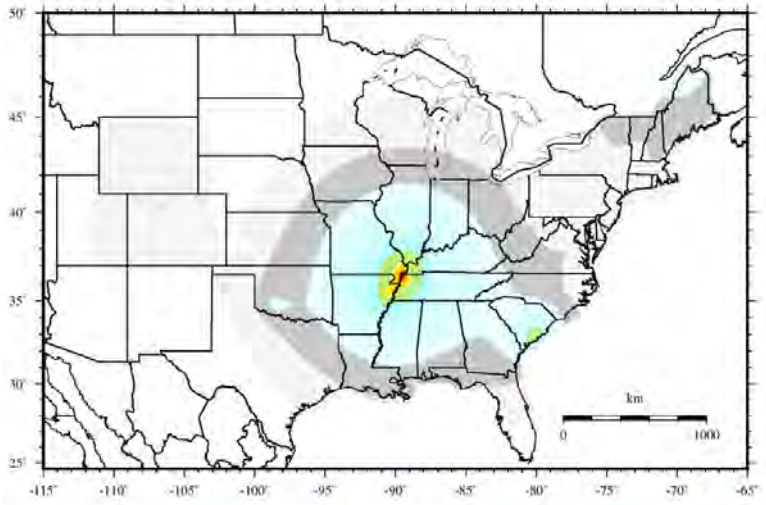


2 Second Total Mean Hazard Comparison (2% in 50 years, uniform hazard rock site)

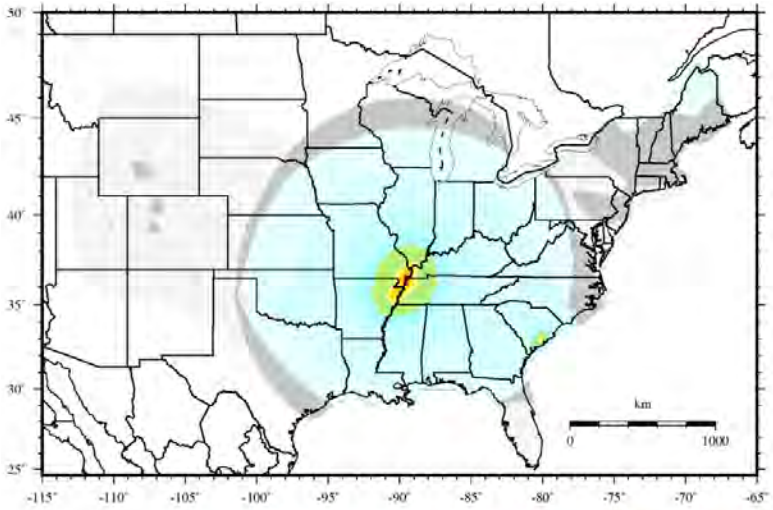
2014 NSHM



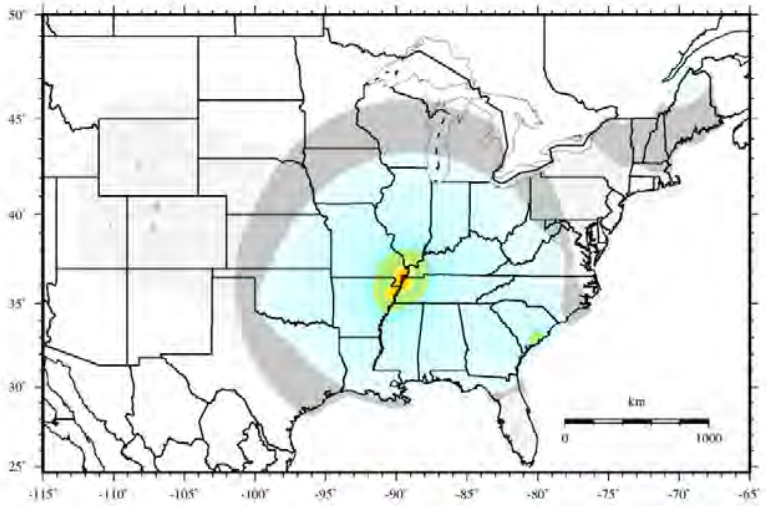
NGA-East USGS



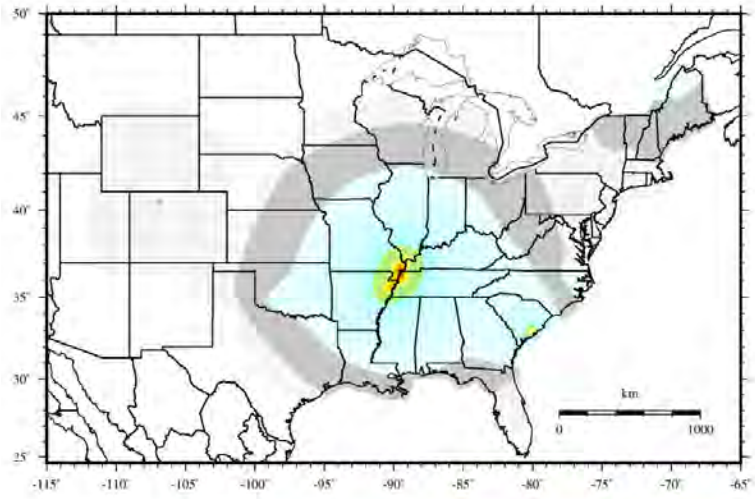
Updated NGA-East Seeds (LT #1)



Updated NGA-East Seeds (LT #2)



Proposed 2018 NSHM

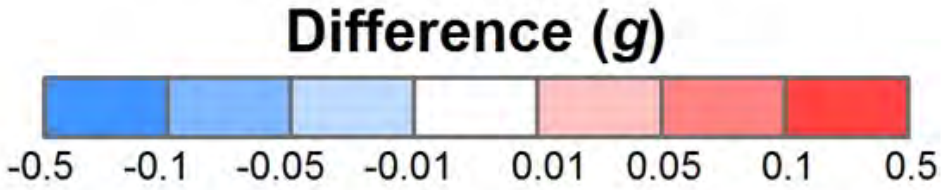


2 Second Spectral Acceleration (g)

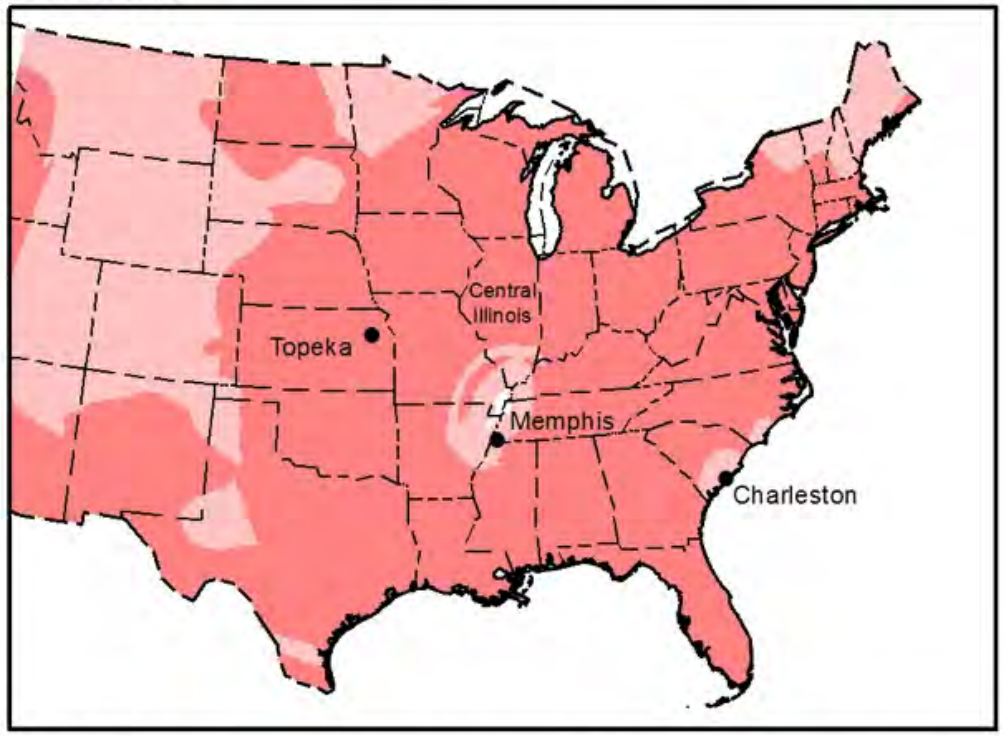
* Proposed 2018 NSHM is Updated NGA-East Seed GMMs (LT#2) with 50% weight and NGA-East USGS GMMs with 50% weight

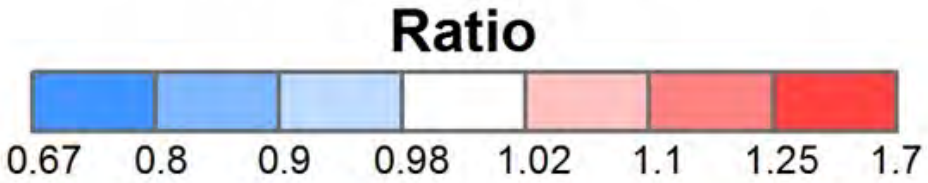
2 Second Total Mean Hazard Comparison

Updated NGA-East Seed GMMs
(logic tree 1) – (logic tree 2)



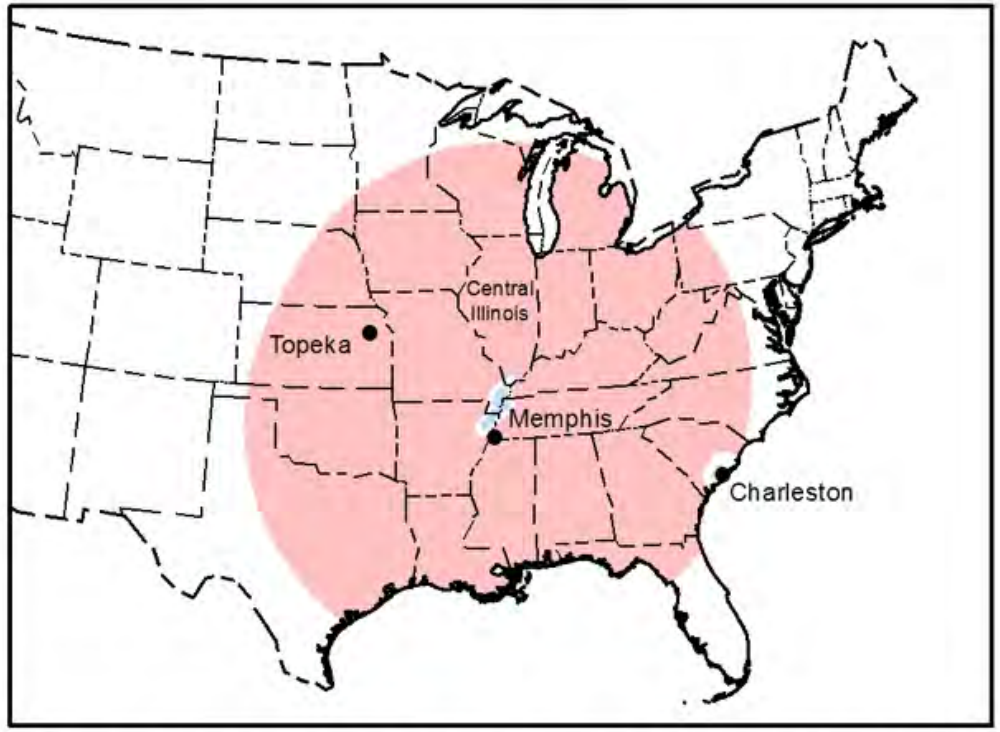
Updated NGA-East Seed GMMs
(logic tree 1)/(logic tree 2)

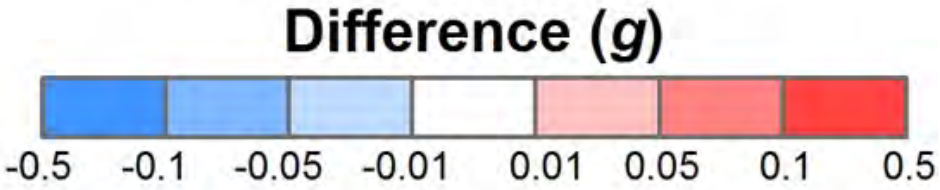




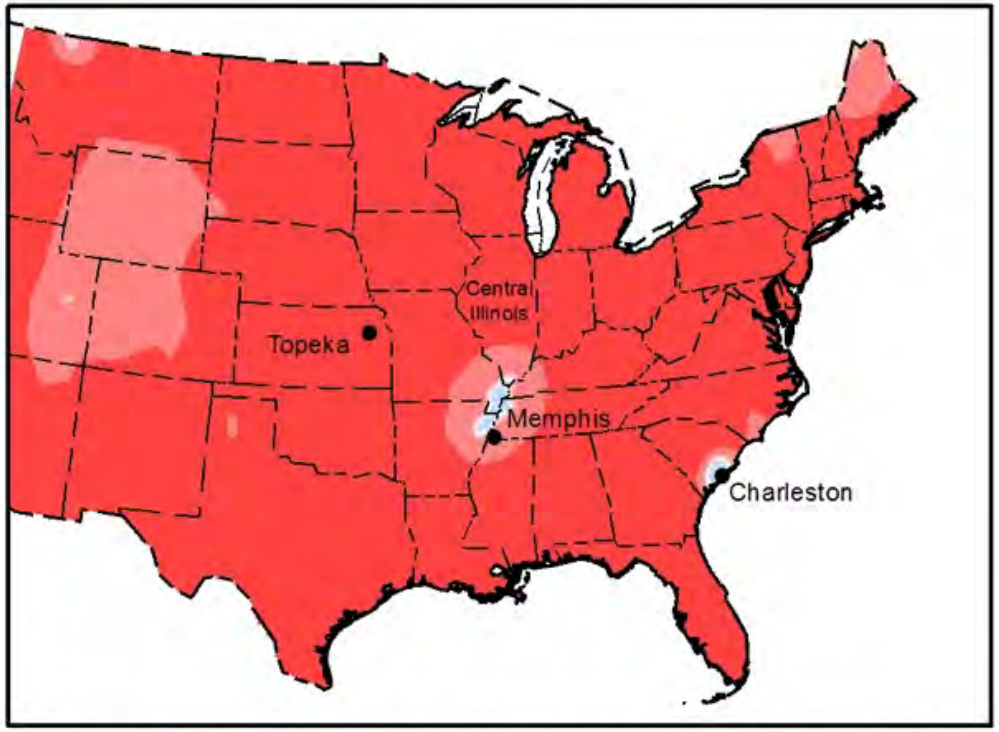
2 Second Total Mean Hazard Comparison

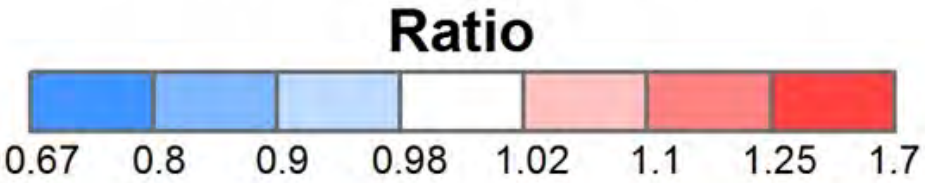
(Updated NGA-East Seed GMMs: logic tree 1) – (NGA-East USGS GMMs)





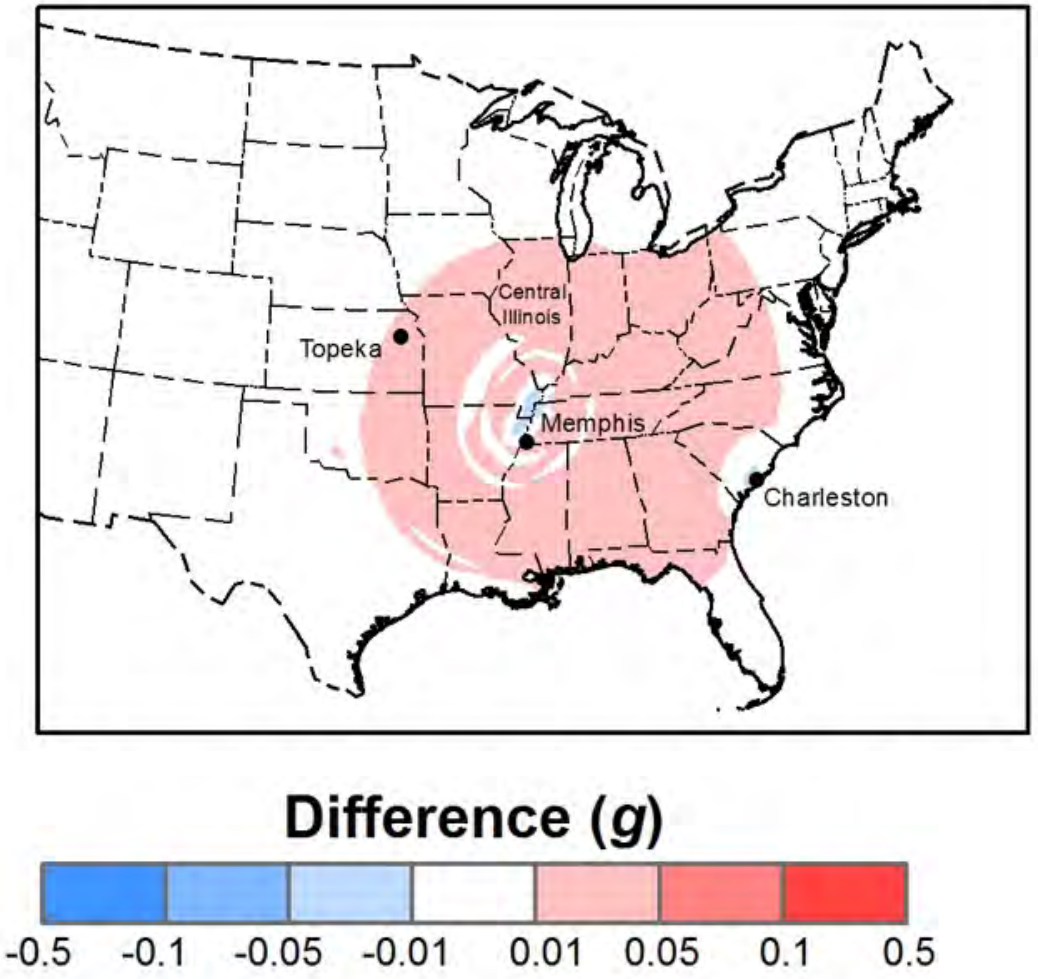
(Updated NGA-East Seed GMMs: logic tree 1) / (NGA-East USGS GMMs)



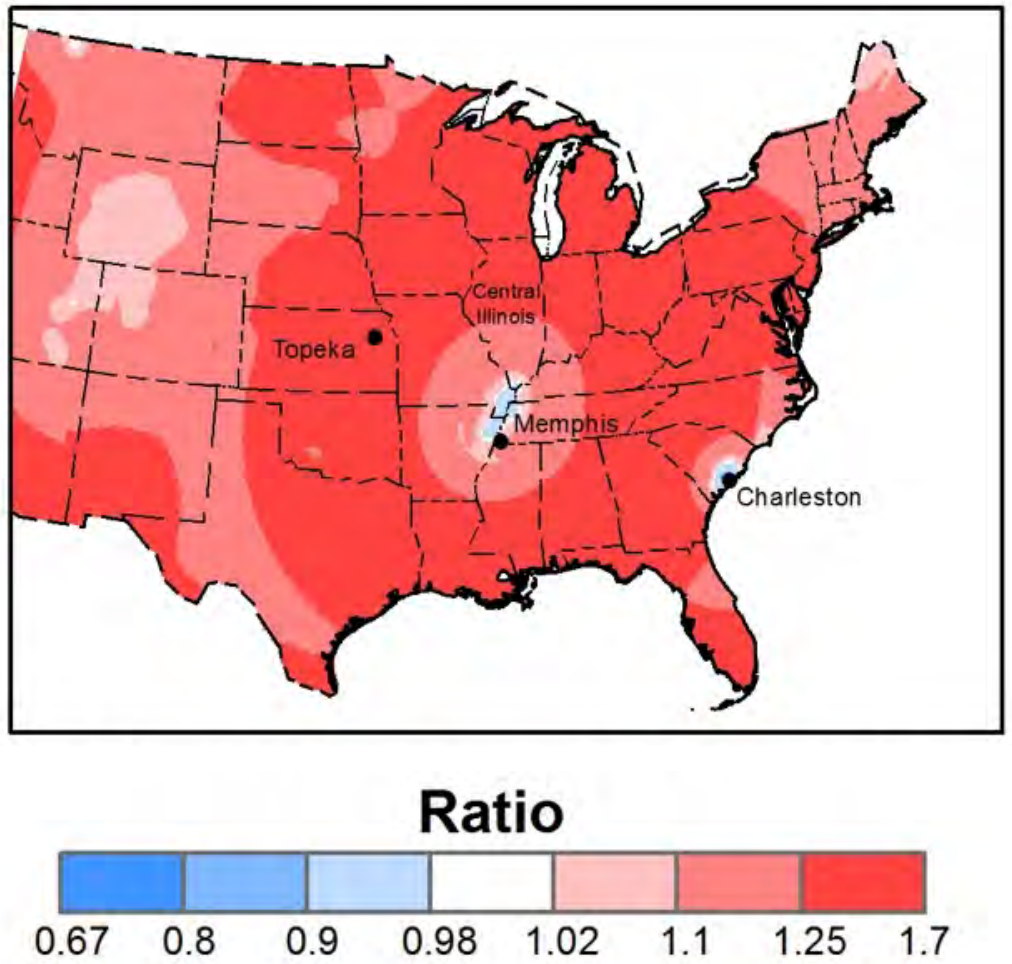


2 Second Total Mean Hazard Comparison

(Updated NGA-East Seed GMMs: logic tree 2) – (NGA-East USGS GMMs)

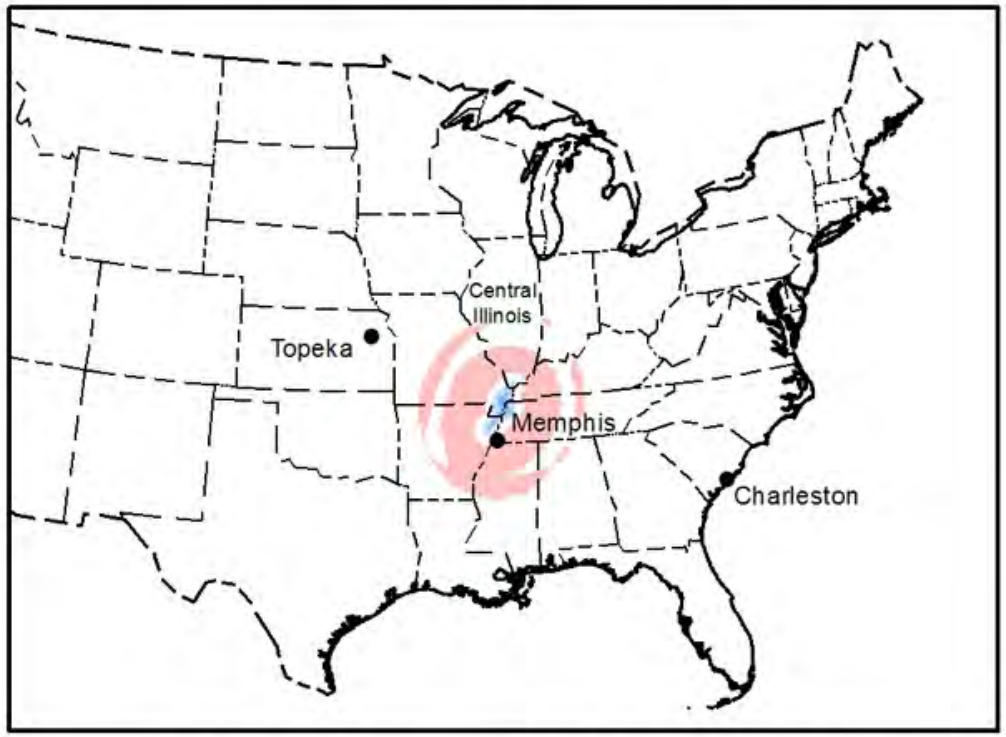


(Updated NGA-East Seed GMMs: logic tree 2) / (NGA-East USGS GMMs)



2 Second Total Mean Hazard Comparison

(Proposed 2018 NSHM) – (2014 NSHM)



Difference (*g*)

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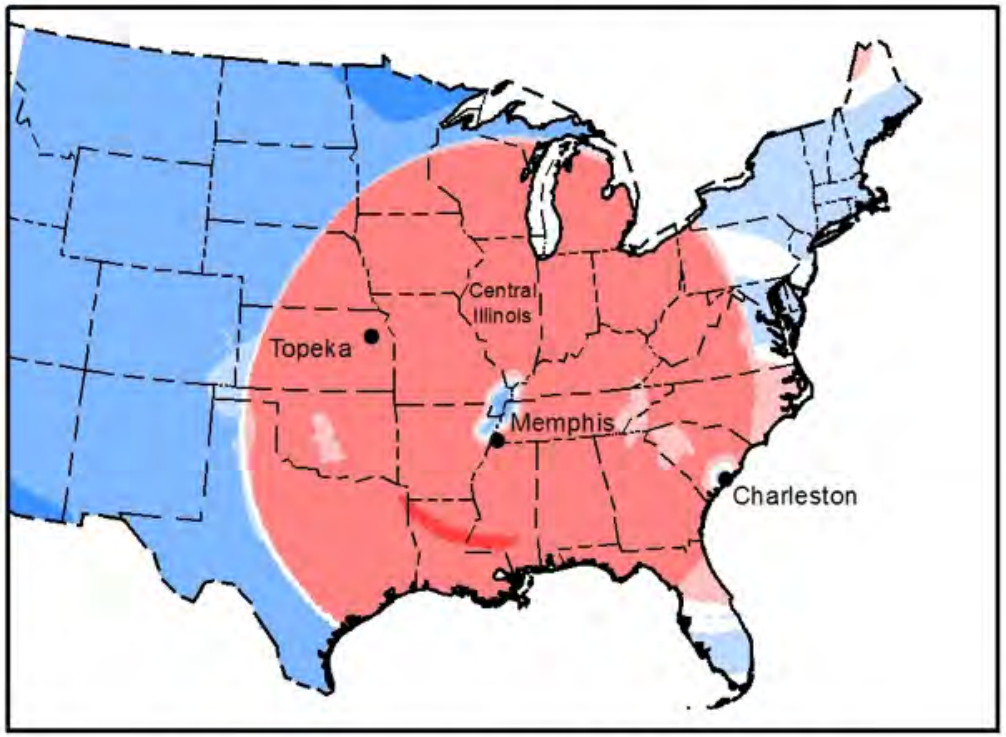
(Proposed 2018 NSHM) / (2014 NSHM)



Ratio

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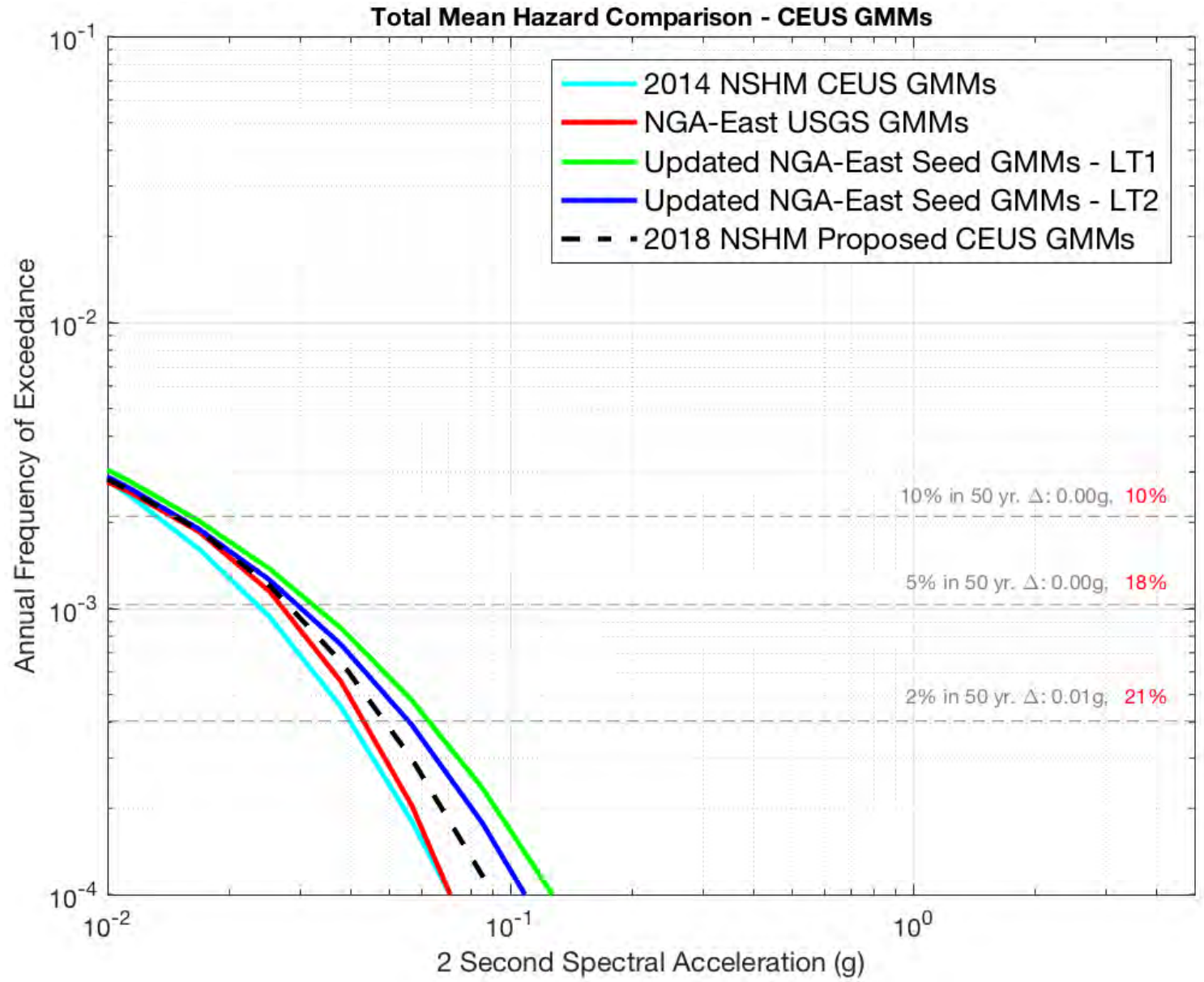
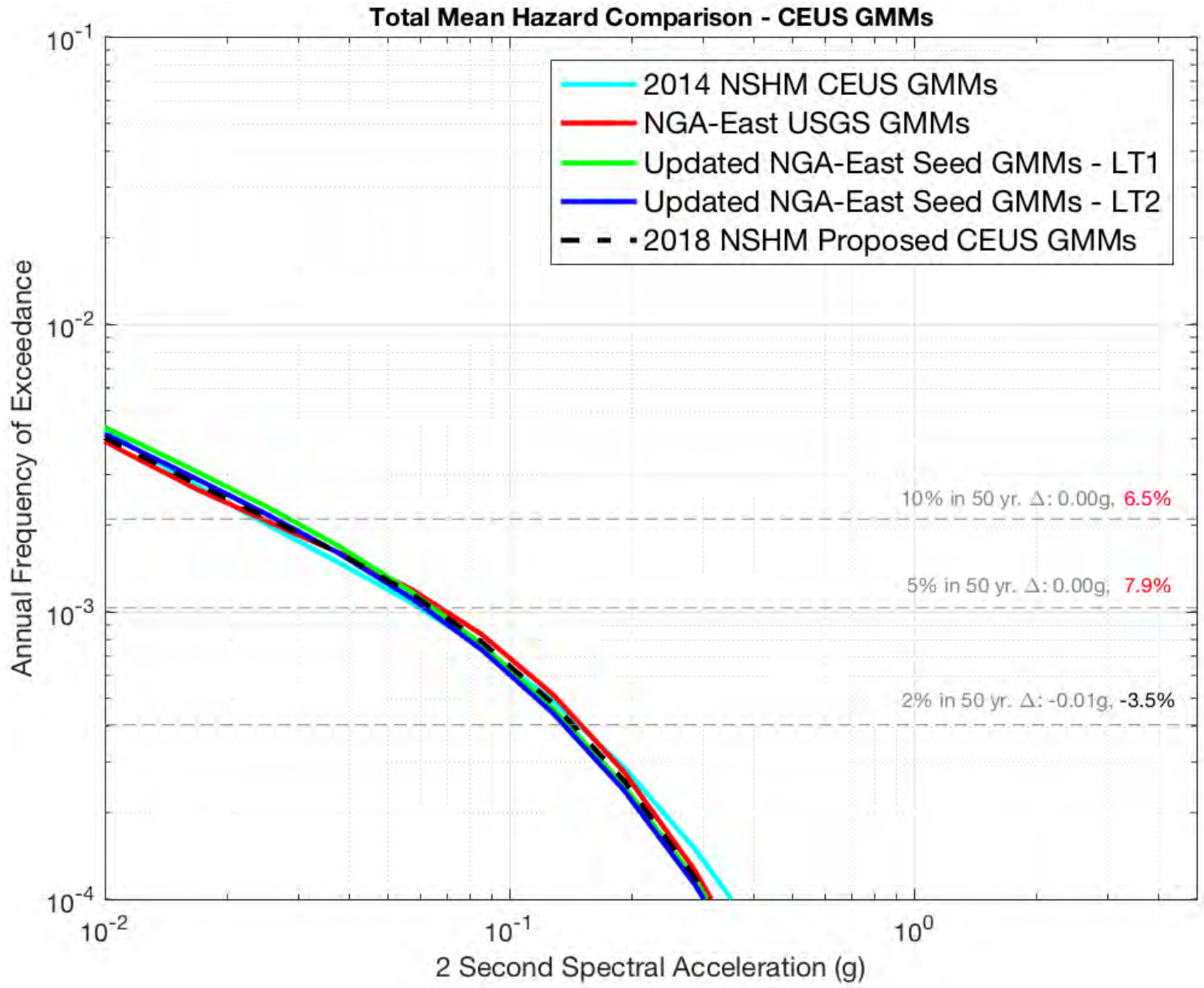
Hazard Curves: Central Illinois, IL

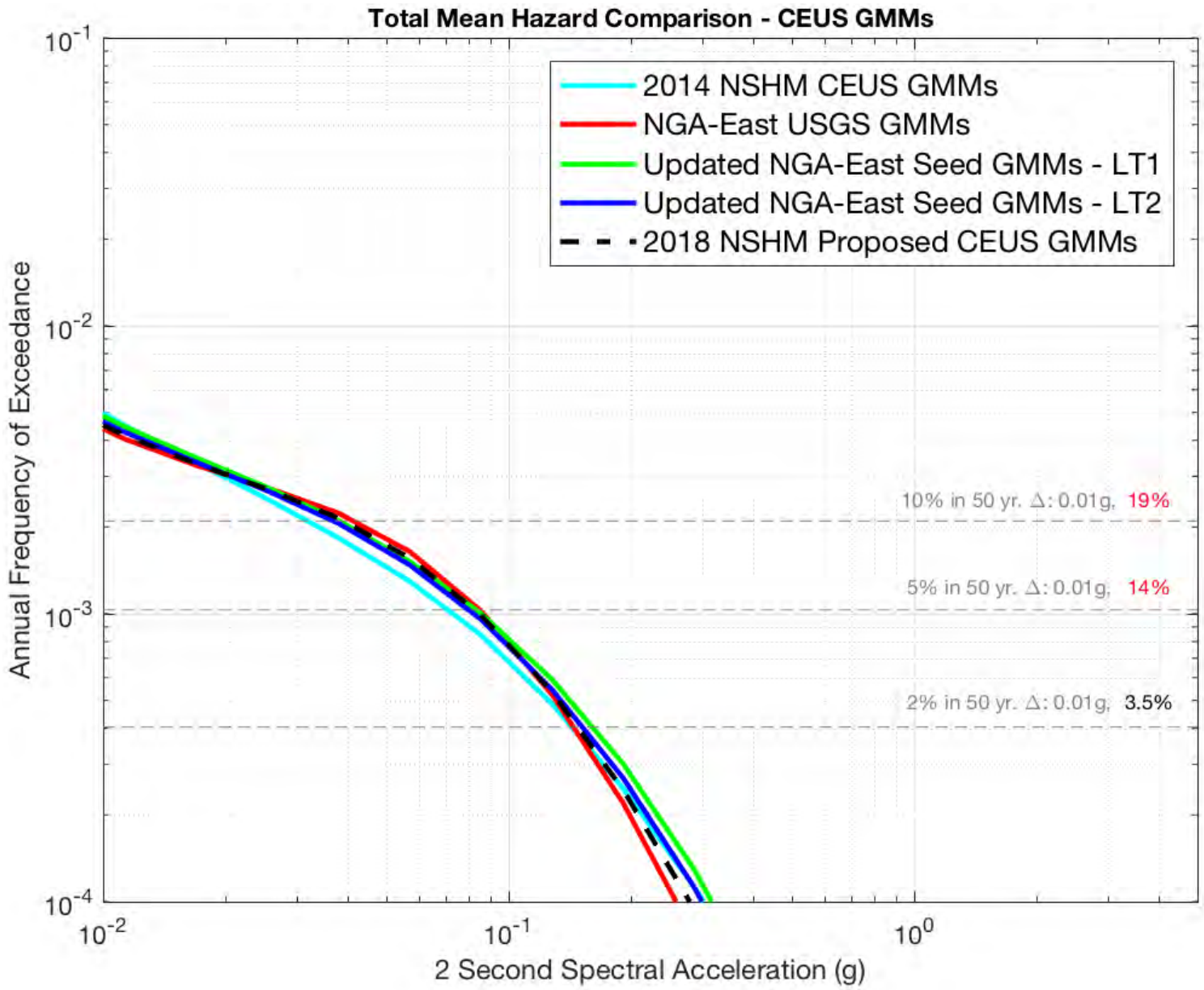


Note: Percent difference is Proposed 2018 NSHM vs. 2014 NSHM

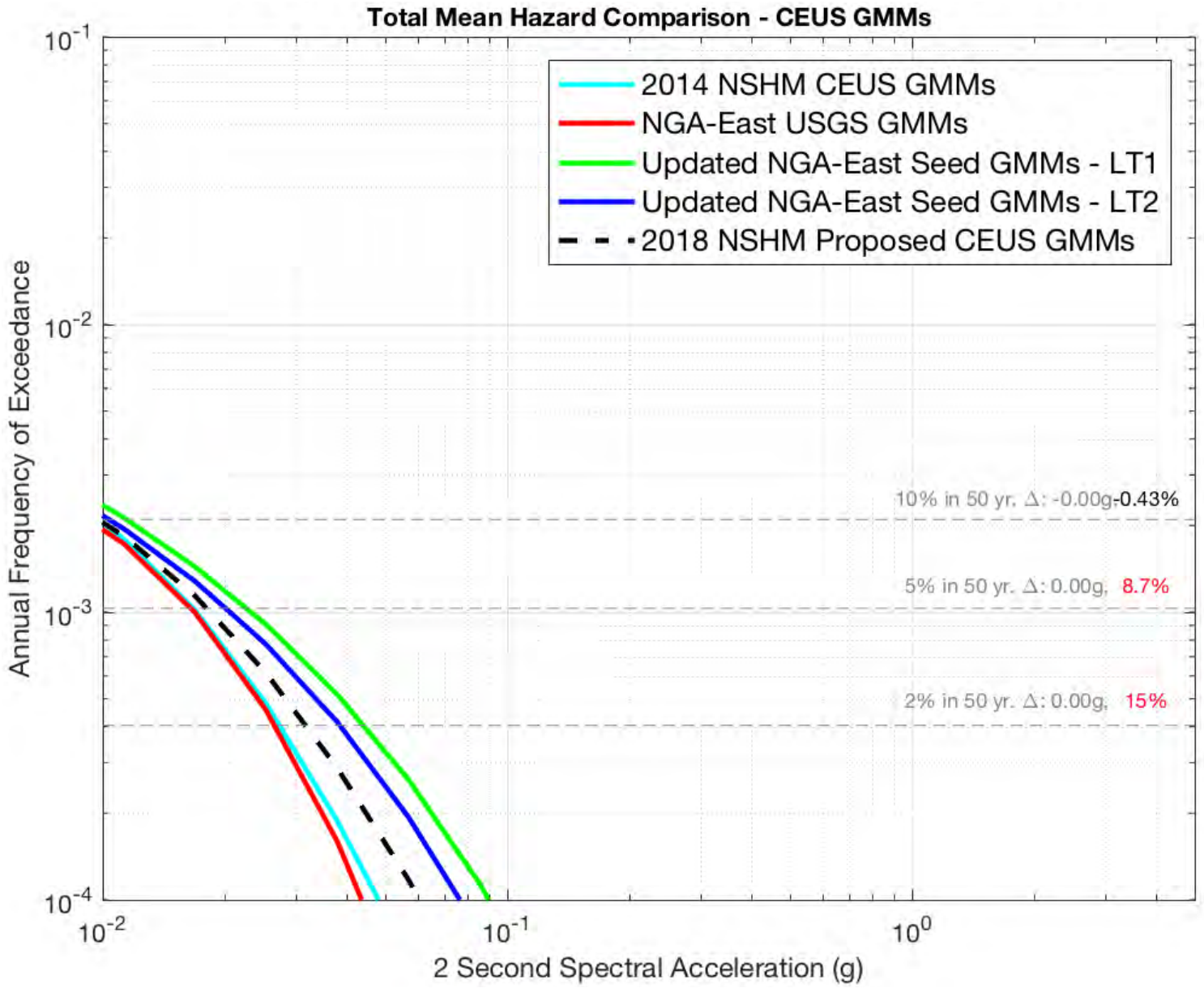
Hazard Curves: Charleston, SC



Hazard Curves: Memphis, TN



Hazard Curves: Topeka, KS



Summary/Discussion

1. Updated NGA-East Seed GMMs: hazard from LT#1 is higher than from LT#2 (~10% at short periods and 10-25% at long periods).

2. Besides certain RLMEs (NMSZ, Charleston, and Meers), the hazard from the Updated NGA-East Seed GMMs (LT#1 and LT#2) is ~10-70% higher than the hazard from the NGA-East USGS GMMs.

3. The hazard from the Proposed 2018 GMMs (LT#2 and NGA-East USGS GMMs, equally weighted) is up to 25-50% higher within 1000 km of the NMSZ, but up to 20% lower in other areas of the CEUS, compared to the hazard from the 2014 NSHM GMMs.