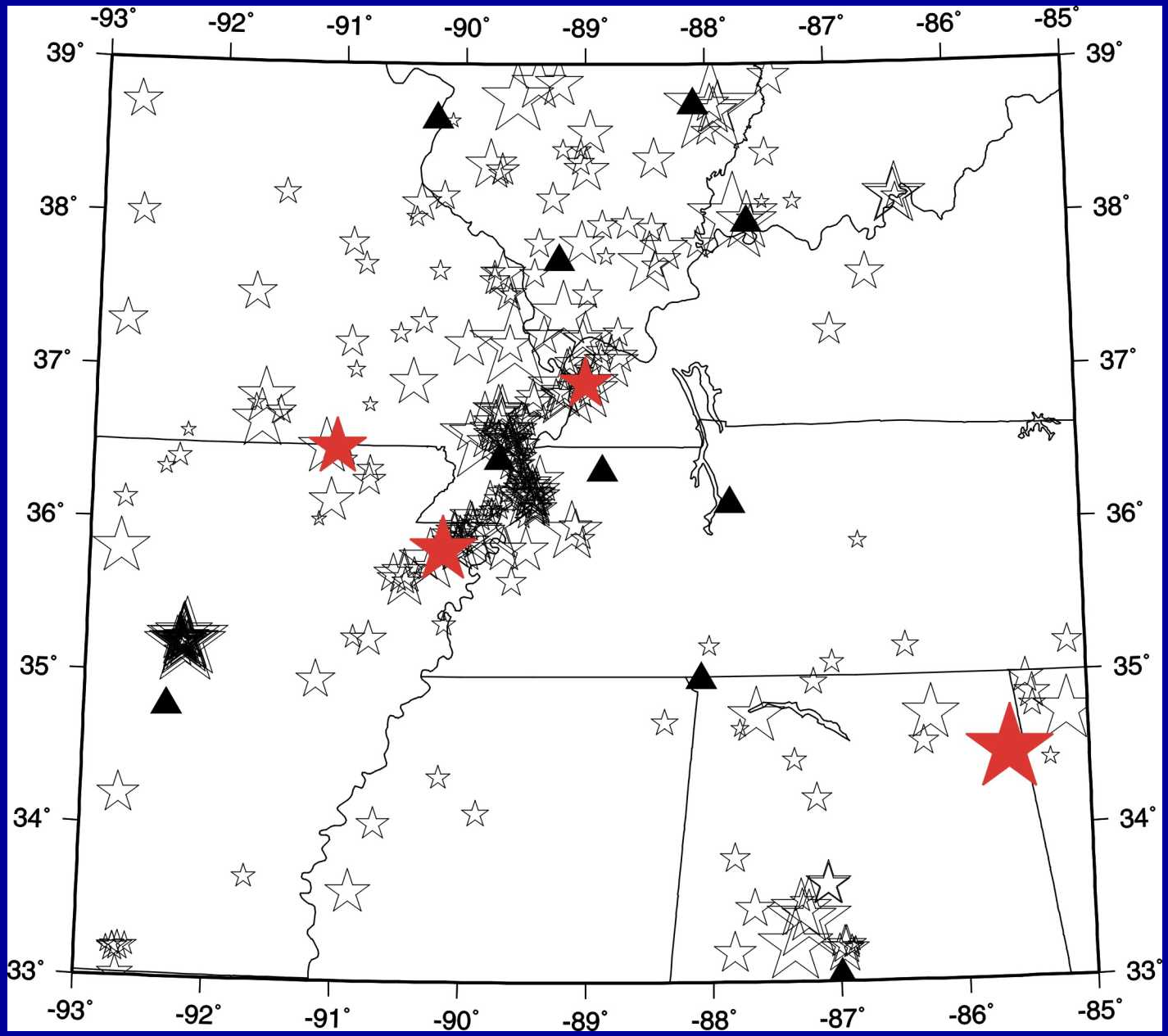
1. New stress drop determinations for CEUS earthquakes

2. Kappa values for CEUS B-C sites

3. Strategy for revising Frankel et al. (1996) attenuation relations to account for finite-fault effects

USGS
science for a changing world

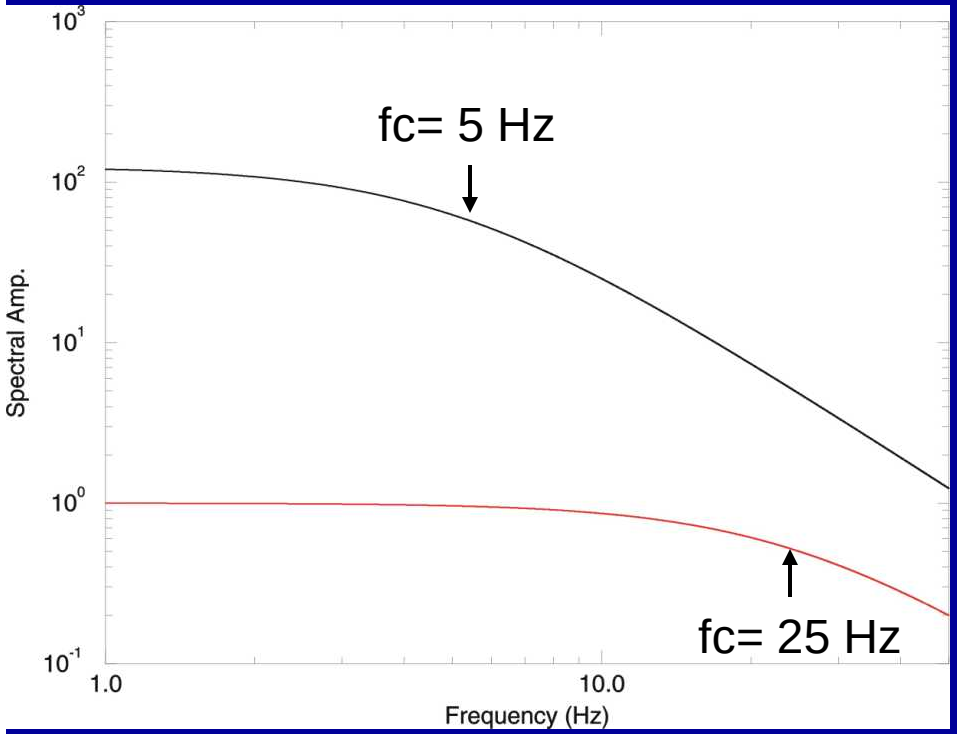


Red stars show earthquakes studied here, Mw 3.6-4.6

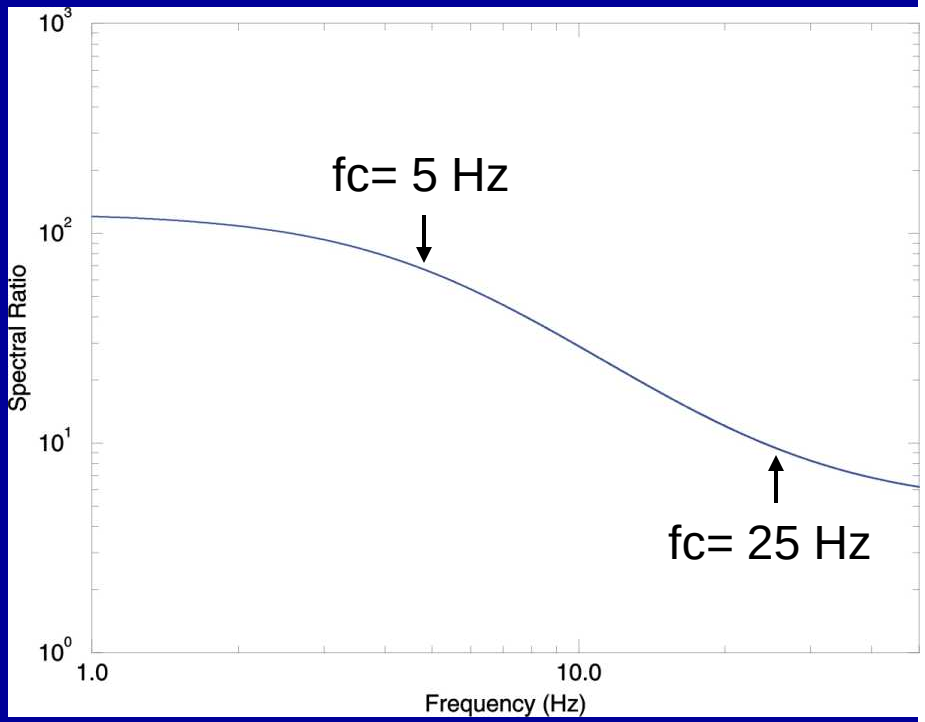
Triangles are broadband stations of the New Madrid seismic network and other ANSS stations used in this study

USGS
science for a changing world

Brune spectra for earthquakes whose moments differ by factor of 125 and have equal stress drops



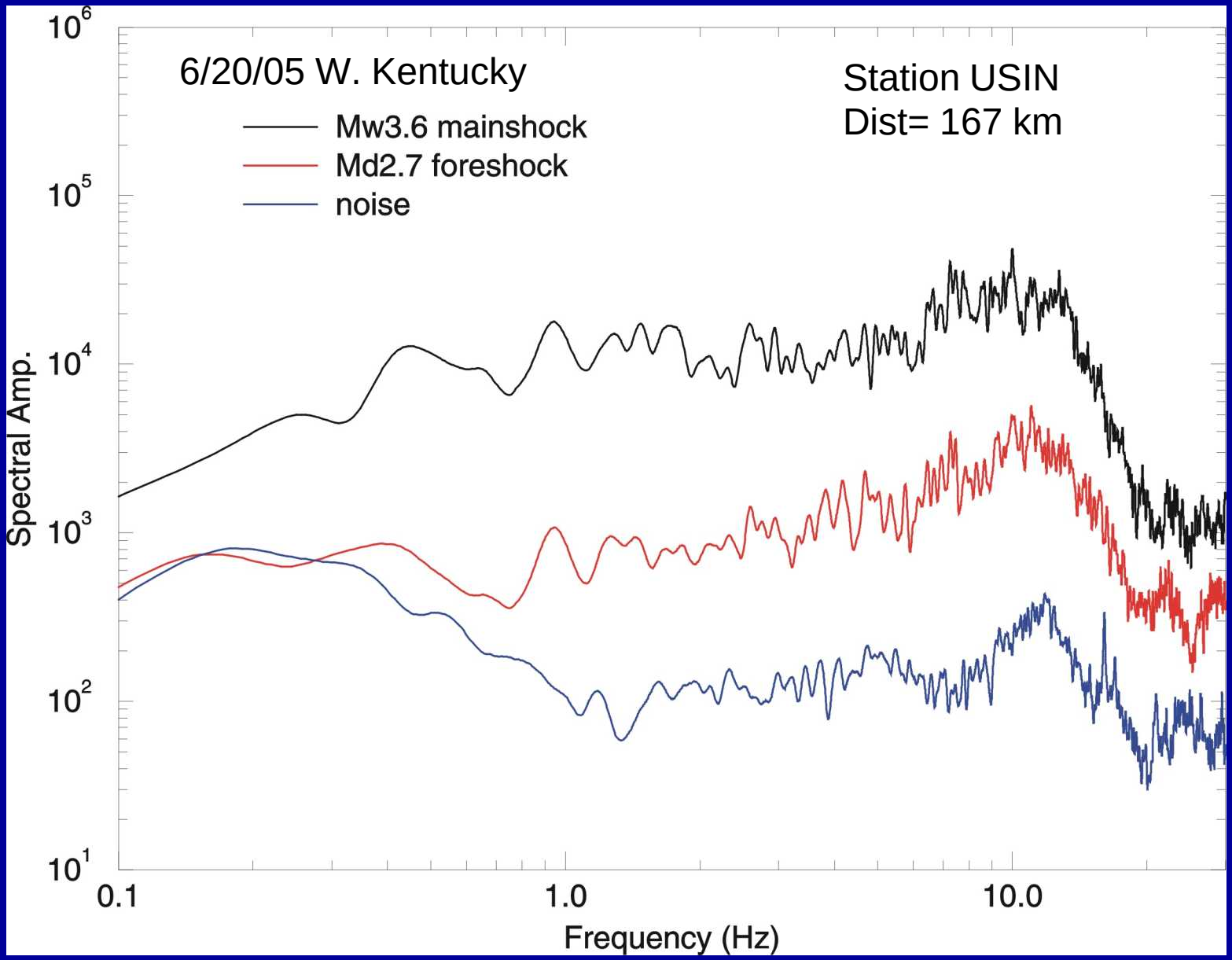
Ratio of spectrum of larger event divided by spectrum of smaller event



Taking spectral ratio of collocated earthquakes removes path and site effects (and instrument response) and provides estimate of corner frequency of large event (and the small event if you have sufficient bandwidth)

USGS science for a changing world

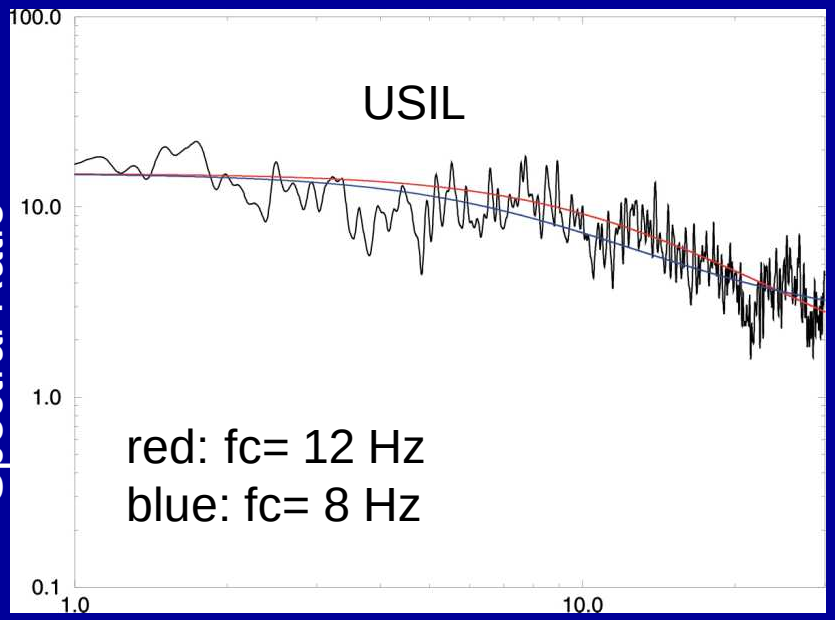
uncorrected spectra (proportional to velocity 1-10 Hz)

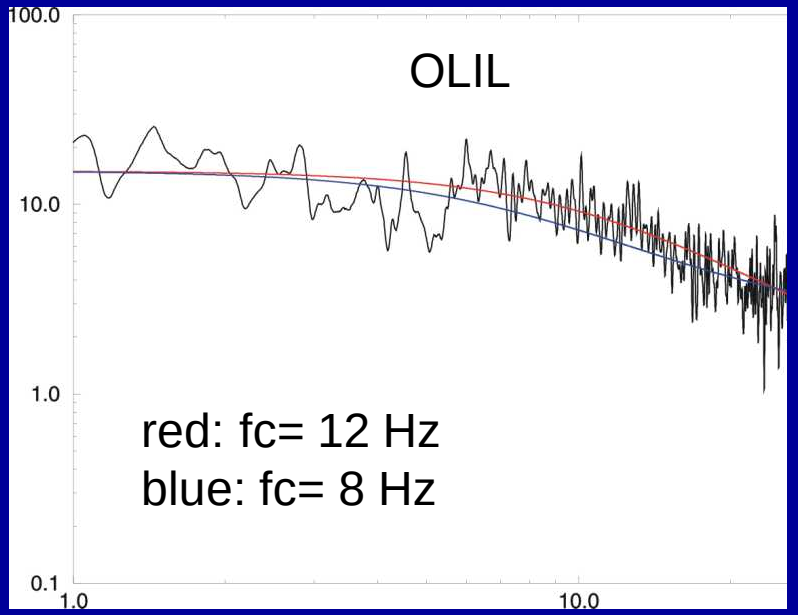


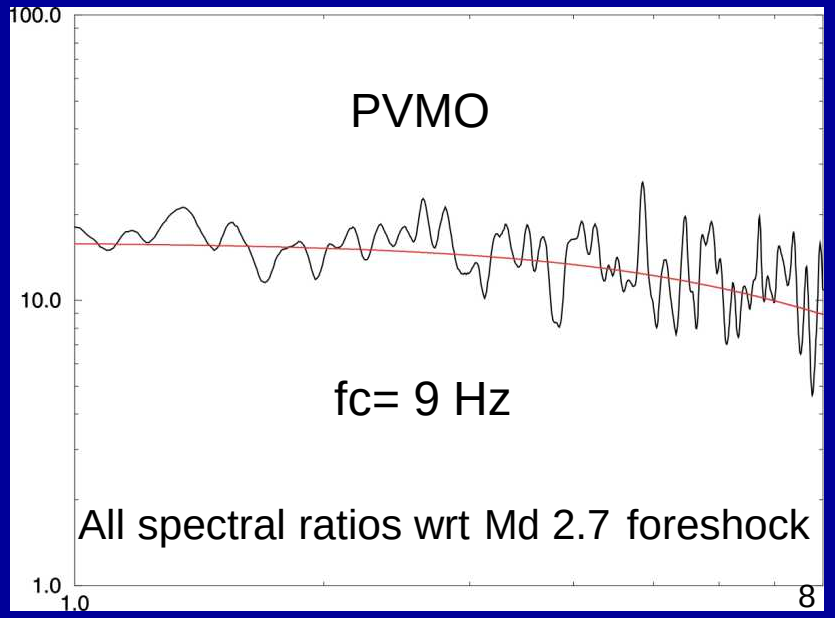
USGS
science for a changing world

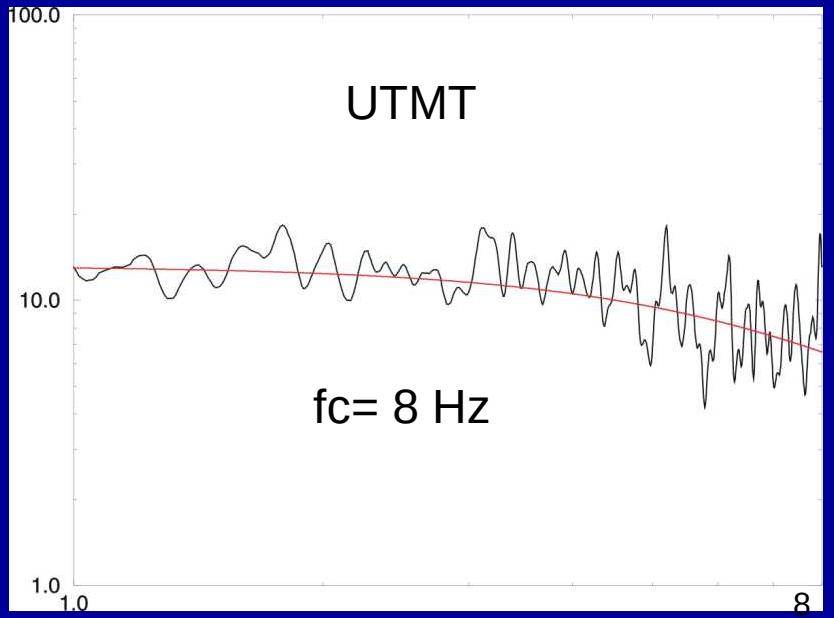
Western Kentucky 6/20/05 12:21 UTC, d= 21 km

Mw= 3.6 (Herrmann), fc= 8-12 Hz, stress drop=270-880 bars









Spectral Ratio

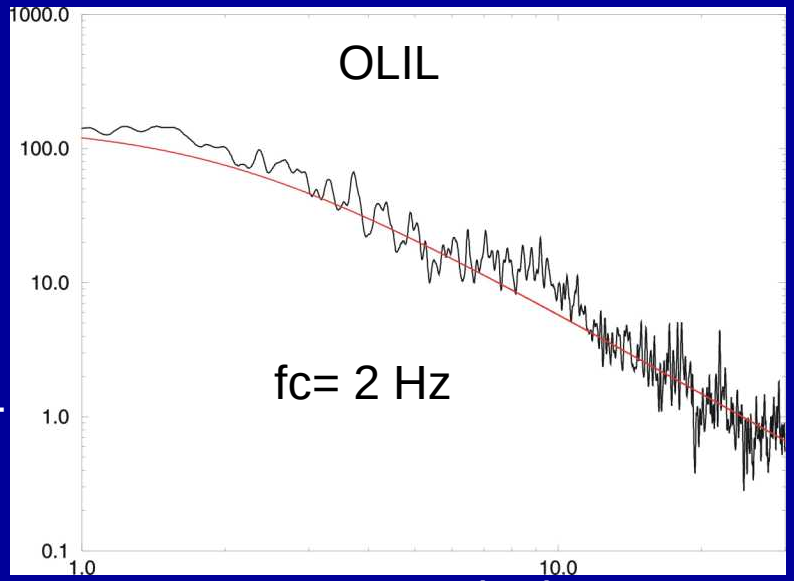
Spectral Ratio

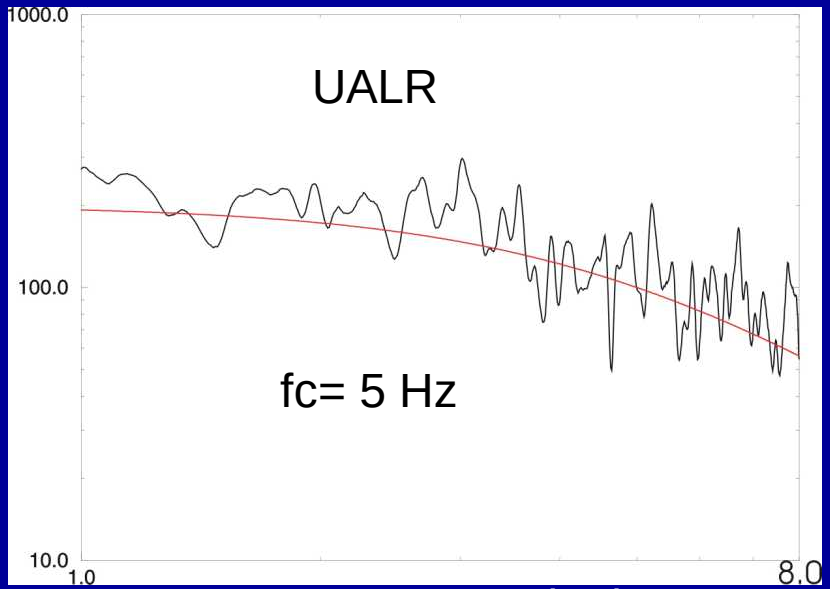
Frequency (Hz)

Frequency (Hz)

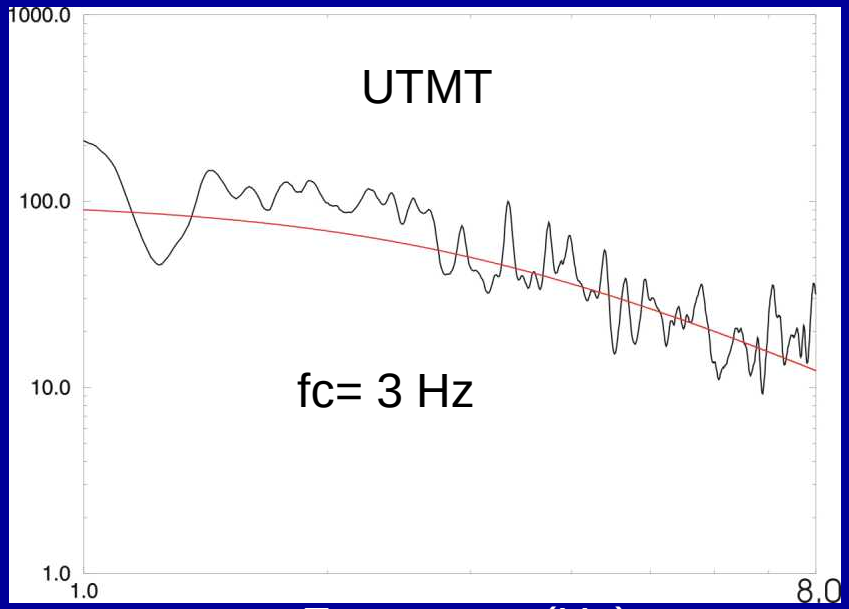
USGS science for a changing world

5/1/2005 12:37 UT, NE Arkansas, d= 10 km
Mw= 4.2 (Herrmann), fc= 2-5 Hz, stress drop= 32-510 bars



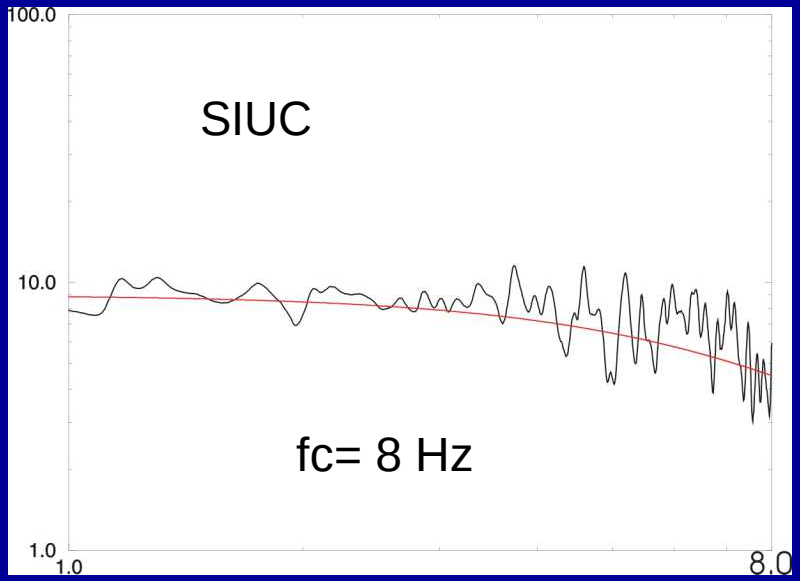


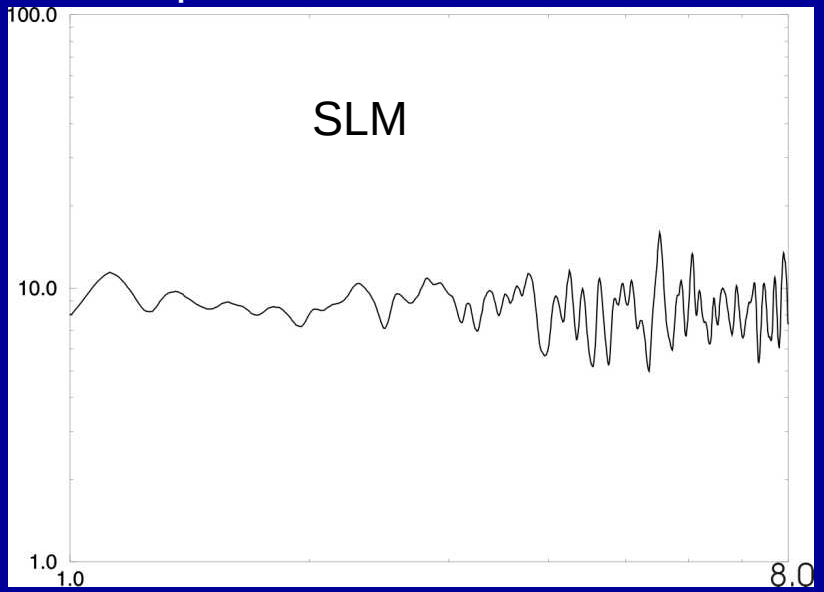
all spectra ratios
wrt Md2.3 aftershock

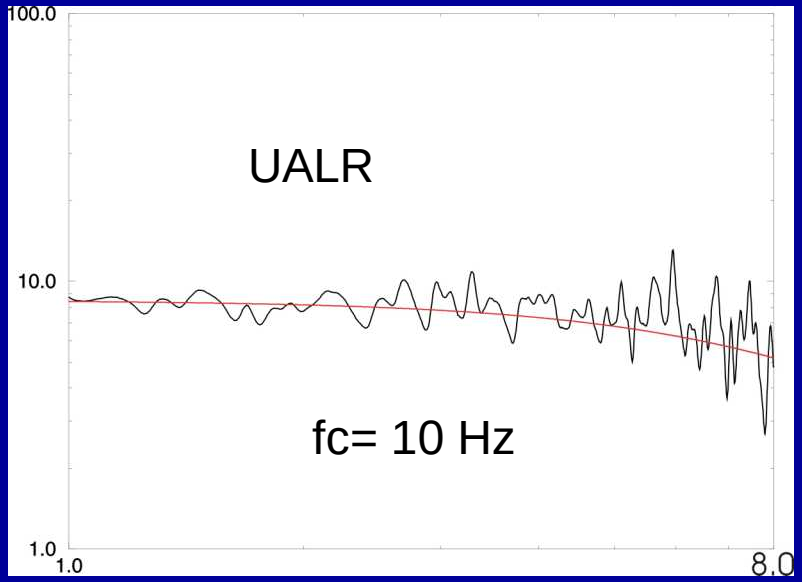


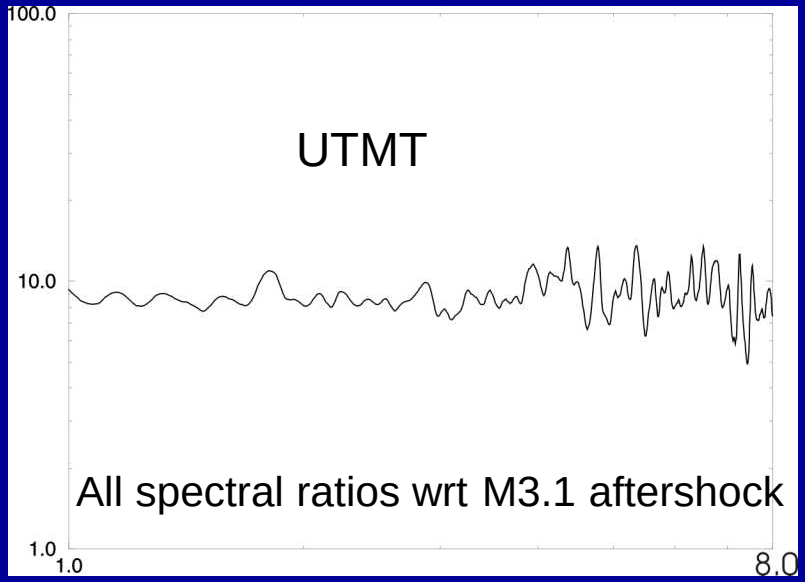
USGS
science for a changing world

10/21/99 8:17 UT, d= 11 km, MO-AR border
Mw= 3.6* fc= 8 Hz, stress drop 410 bars









Spectral Ratio

Spectral Ratio

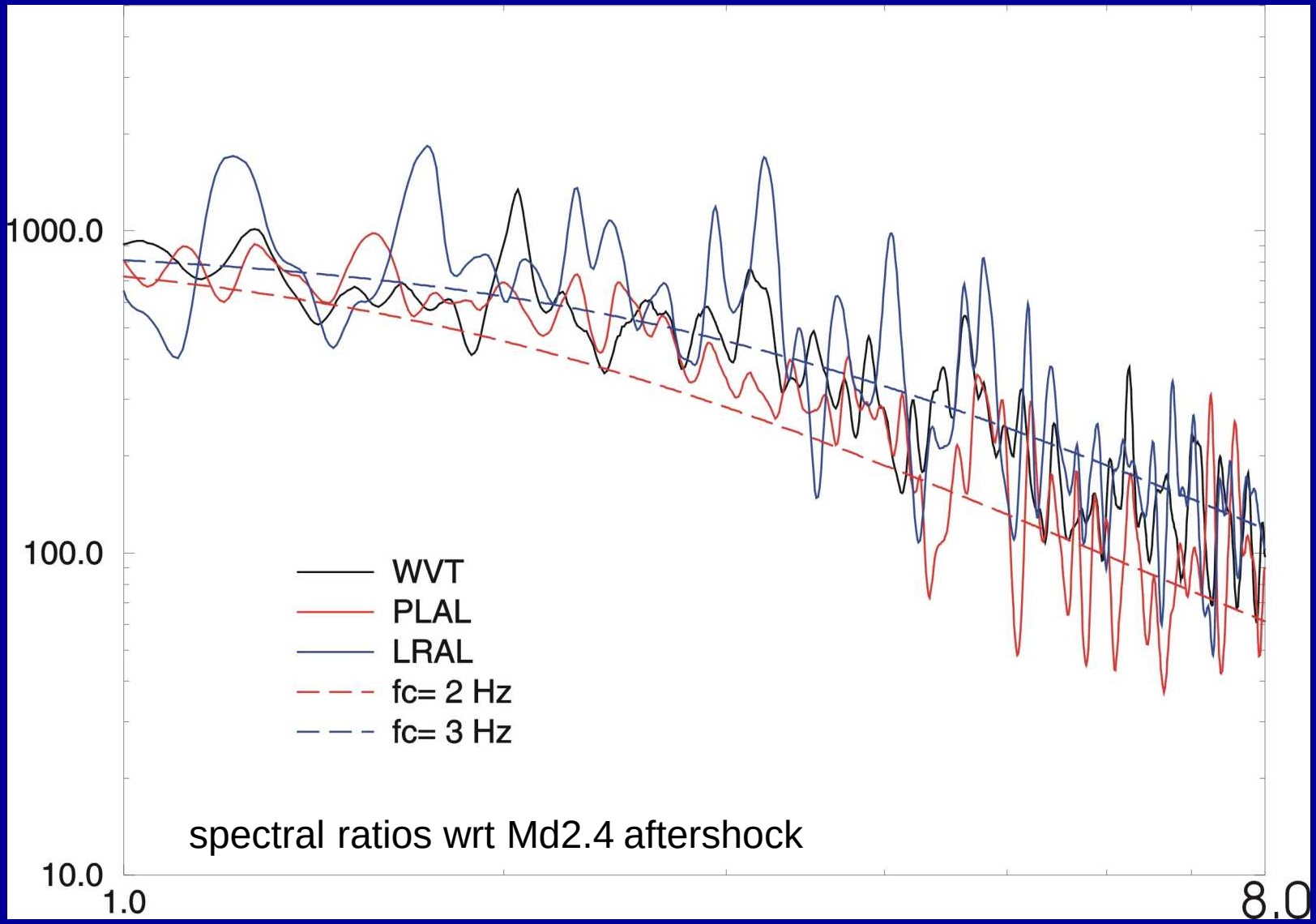
Frequency (Hz)

Frequency (Hz)

* Determined from comparison of spectral levels with 5/1/05 event

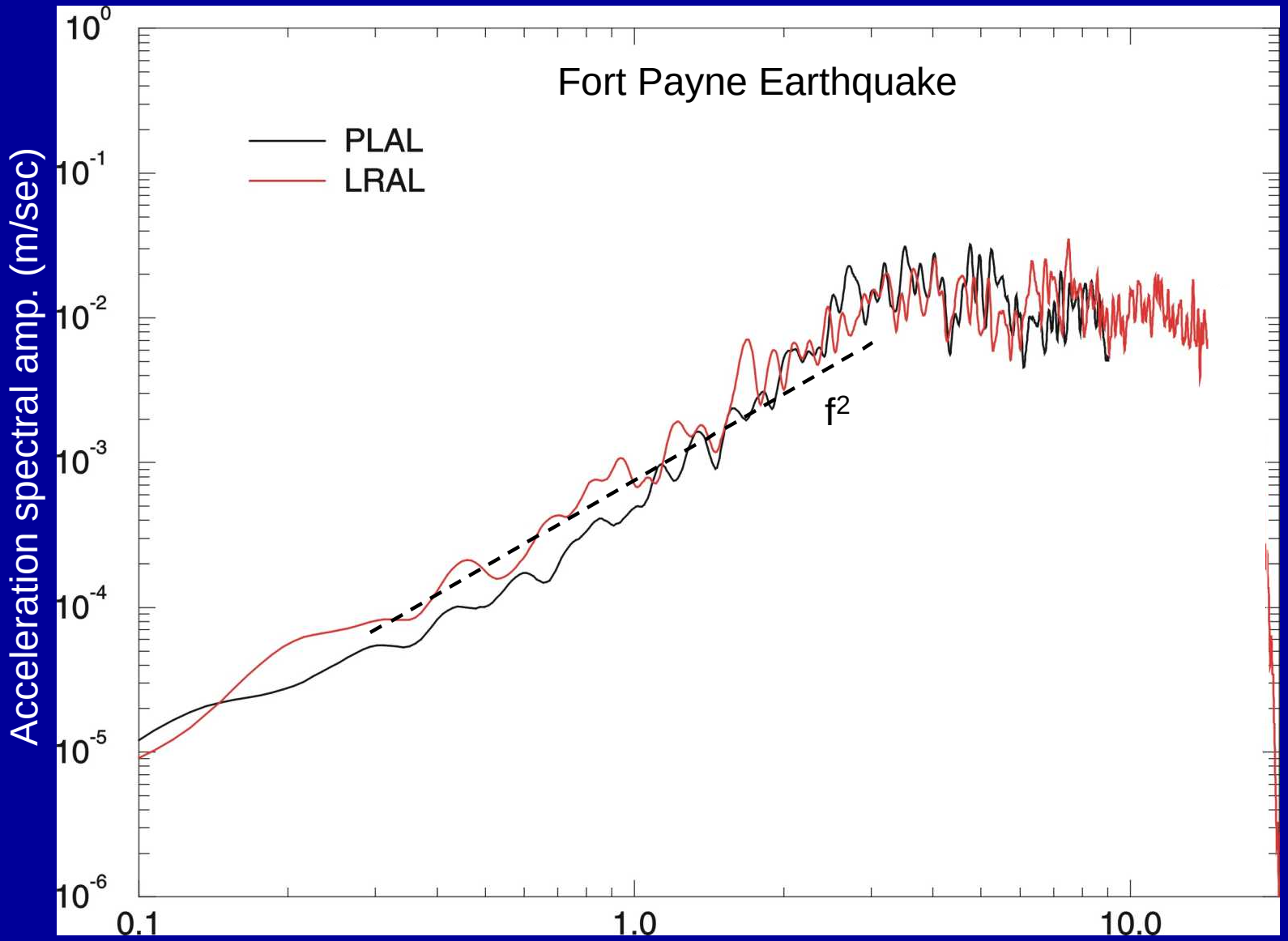
USGS science for a changing world

4/27/03 8:59 UT, Fort Payne Alabama, d= 12 km
Mw= 4.6 (Herrmann), fc= 2-3Hz, stress drop= 130-440 bars



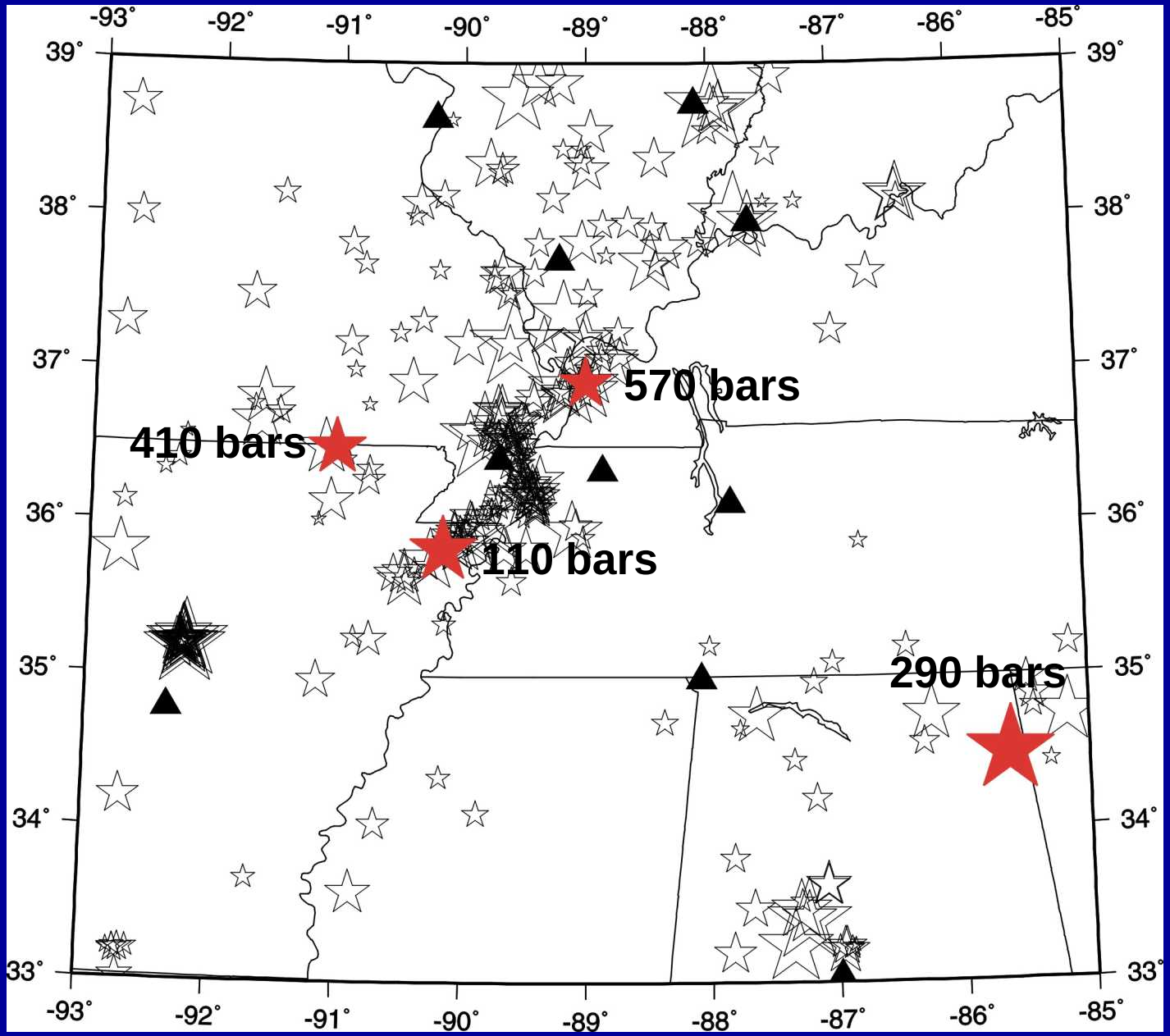
USGS
science for a changing world

Acceleration spectra corrected for Q and instrument response



USGS science for a changing world

Average Stress Drop Determinations



USGS
science for a changing world

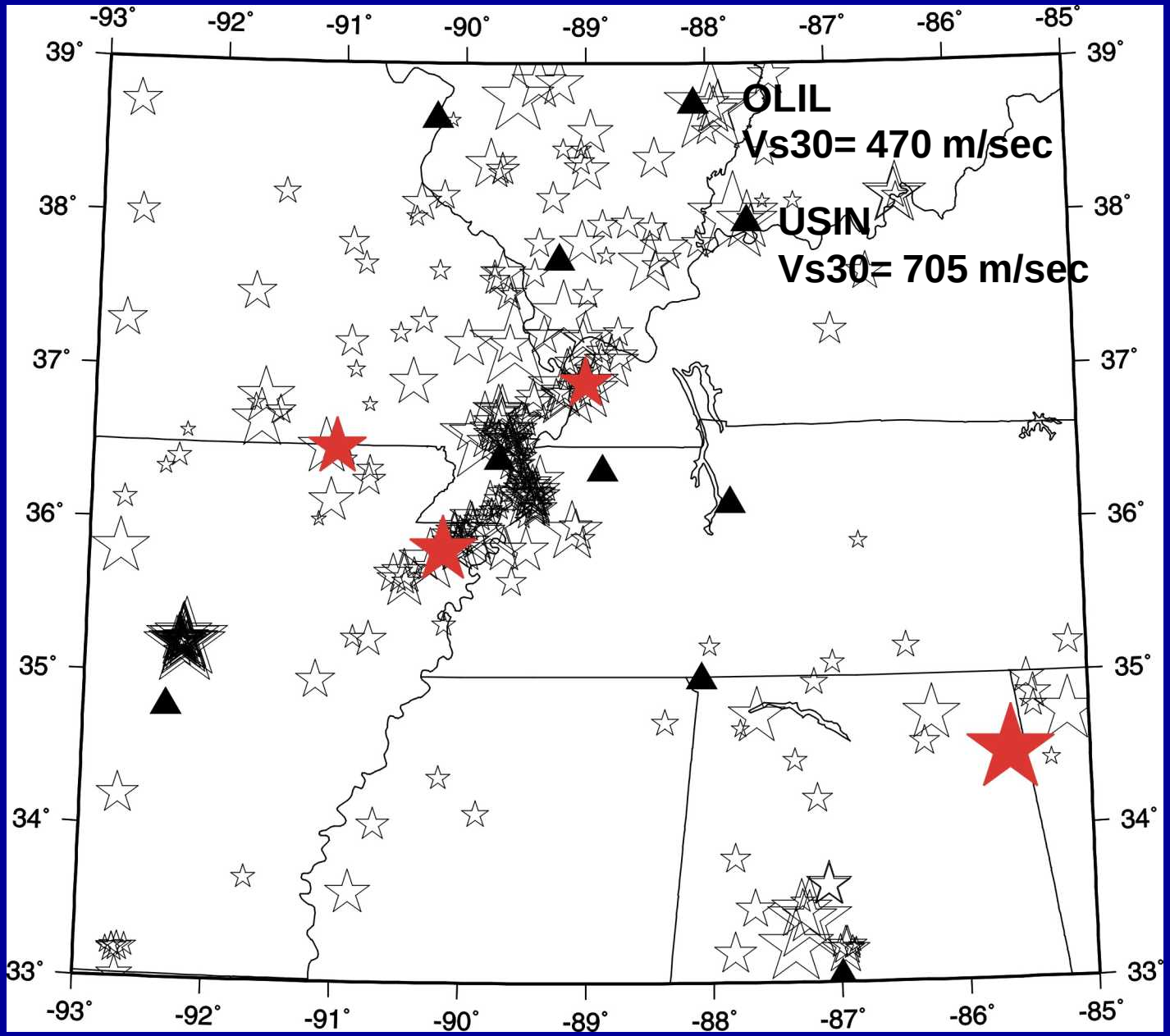
Stress Drop Determinations from Spectral Ratios

location	date	Mw (From Herrmann)	Mblg	Depth (km)	Corner Frequency (hz)	Stress drop (bars)
W. KY	6/20/05 12:21	3.6	3.7	21	8-12	270-880
N.E. AR	5/1/05 12:37	4.2		10	2-5	32-510
MO-AR border	10/21/99 8:18	3.7*	3.9	11	8	410
Fort Payne, AL	4/27/03 8:59	4.6	4.9	12	2-3	130-440
S.W. Utah	2/23/01 21:43	4.2		10	2	32
S.W. Utah	10/22/99 19:06	4.0		6	3	55

* Determined from comparison of spectral levels with 5/1/05 event

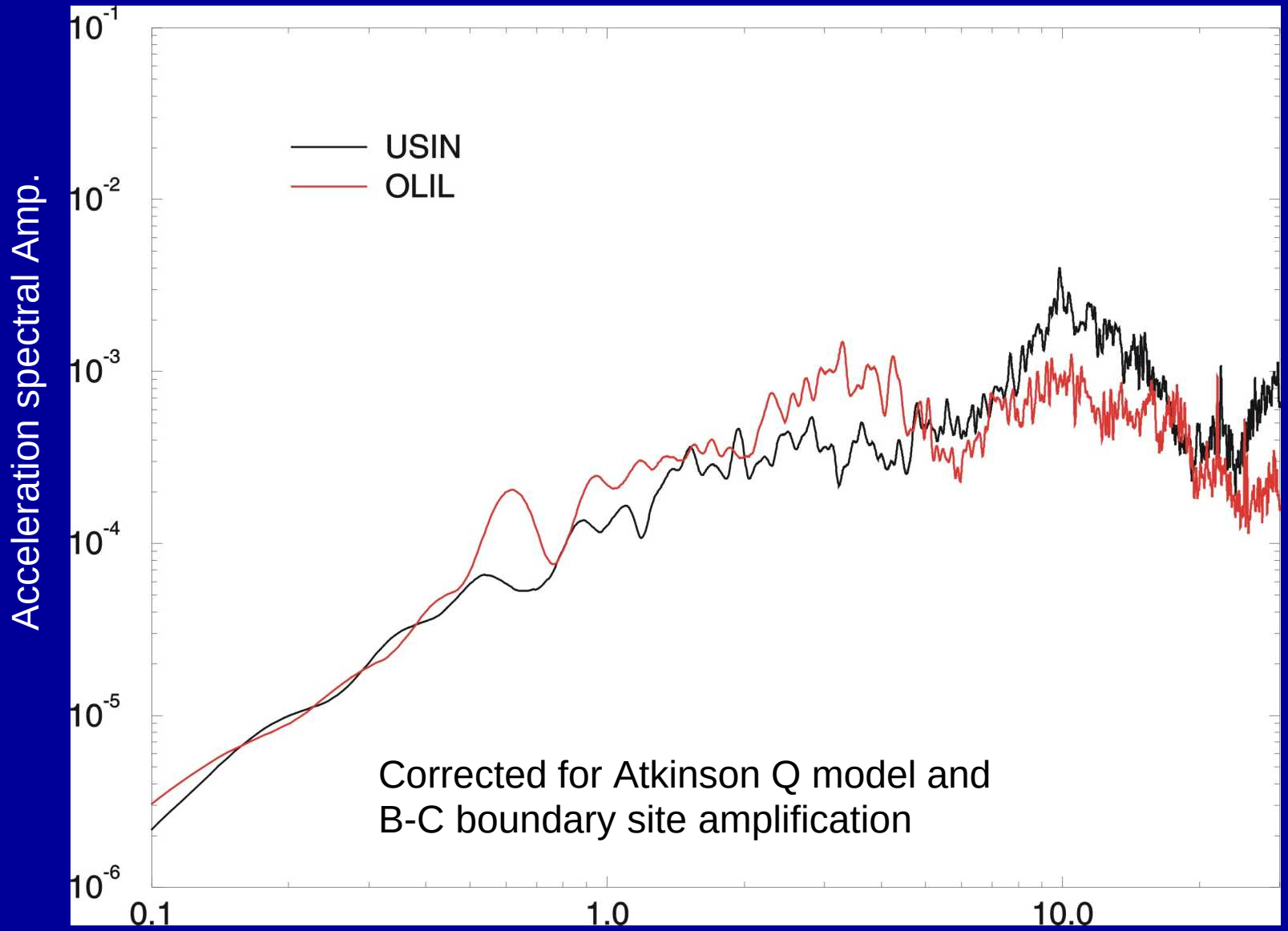
USGS science for a changing world

What is kappa (high-frequency spectral falloff) for CEUS B-C sites? Vs30= 760 m/sec

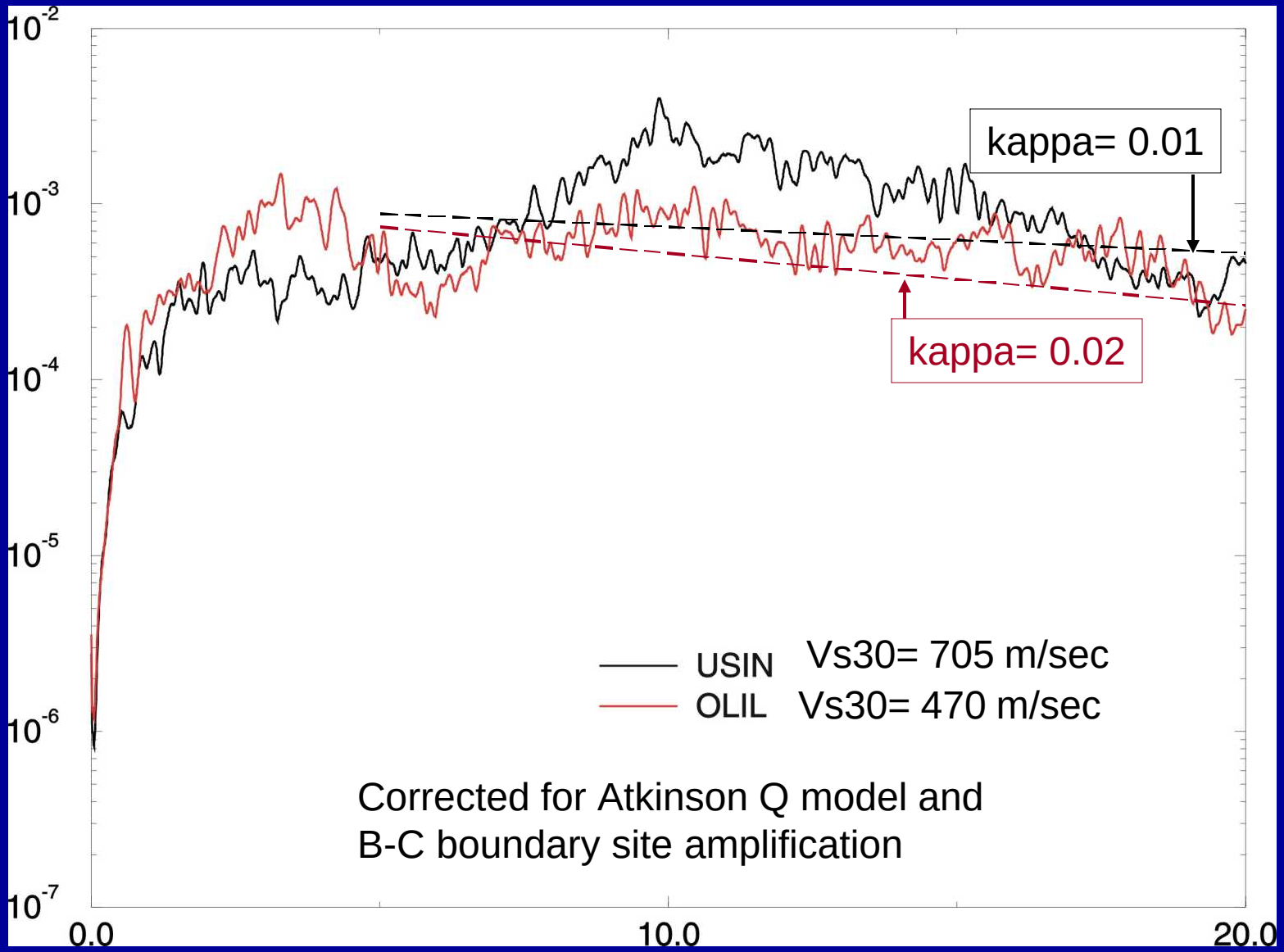


USGS
science for a changing world

5/1/05 earthquake, NE Arkansas, M4.2, fc= 2 Hz (at OLIL)

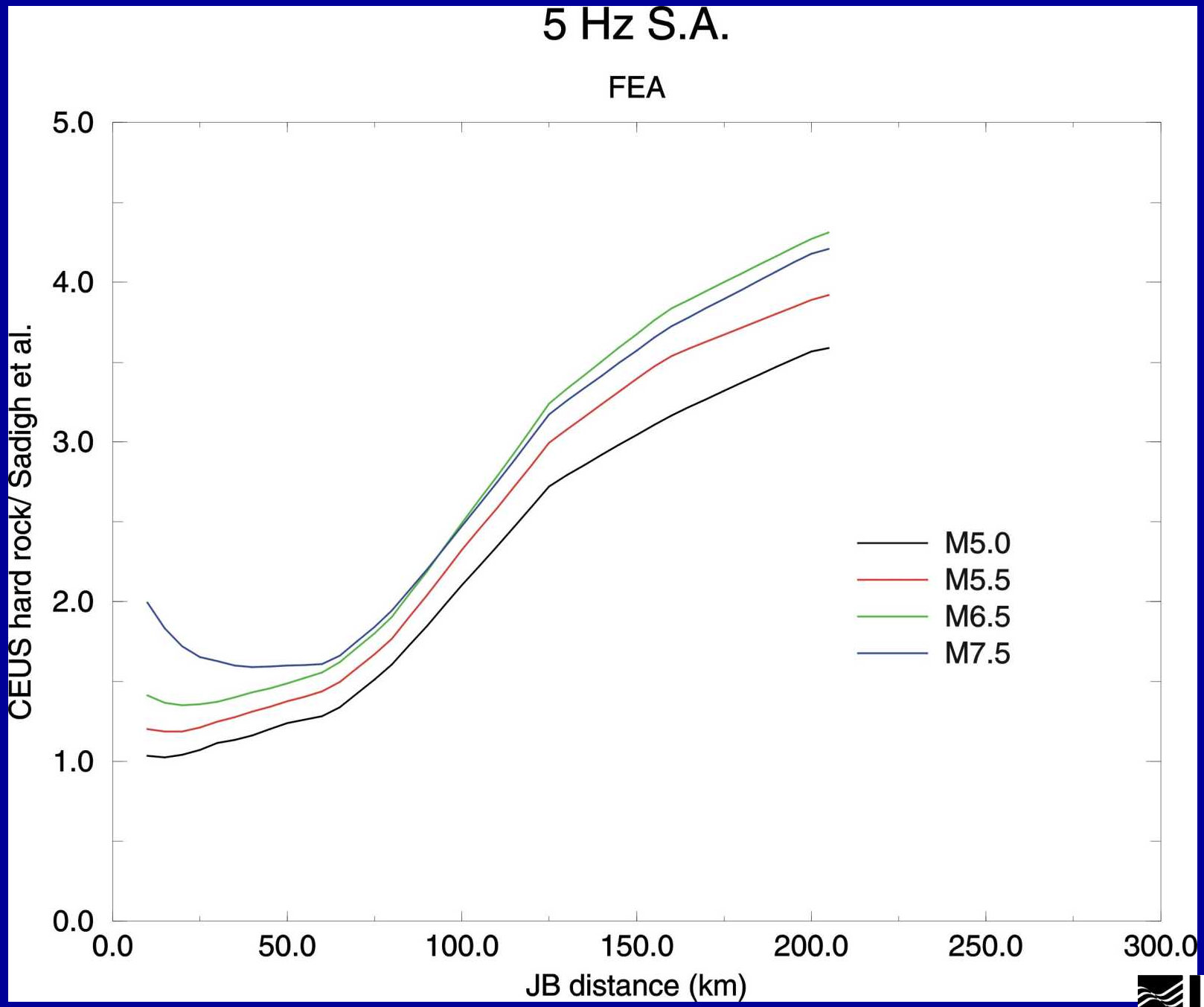


USGS
science for a changing world

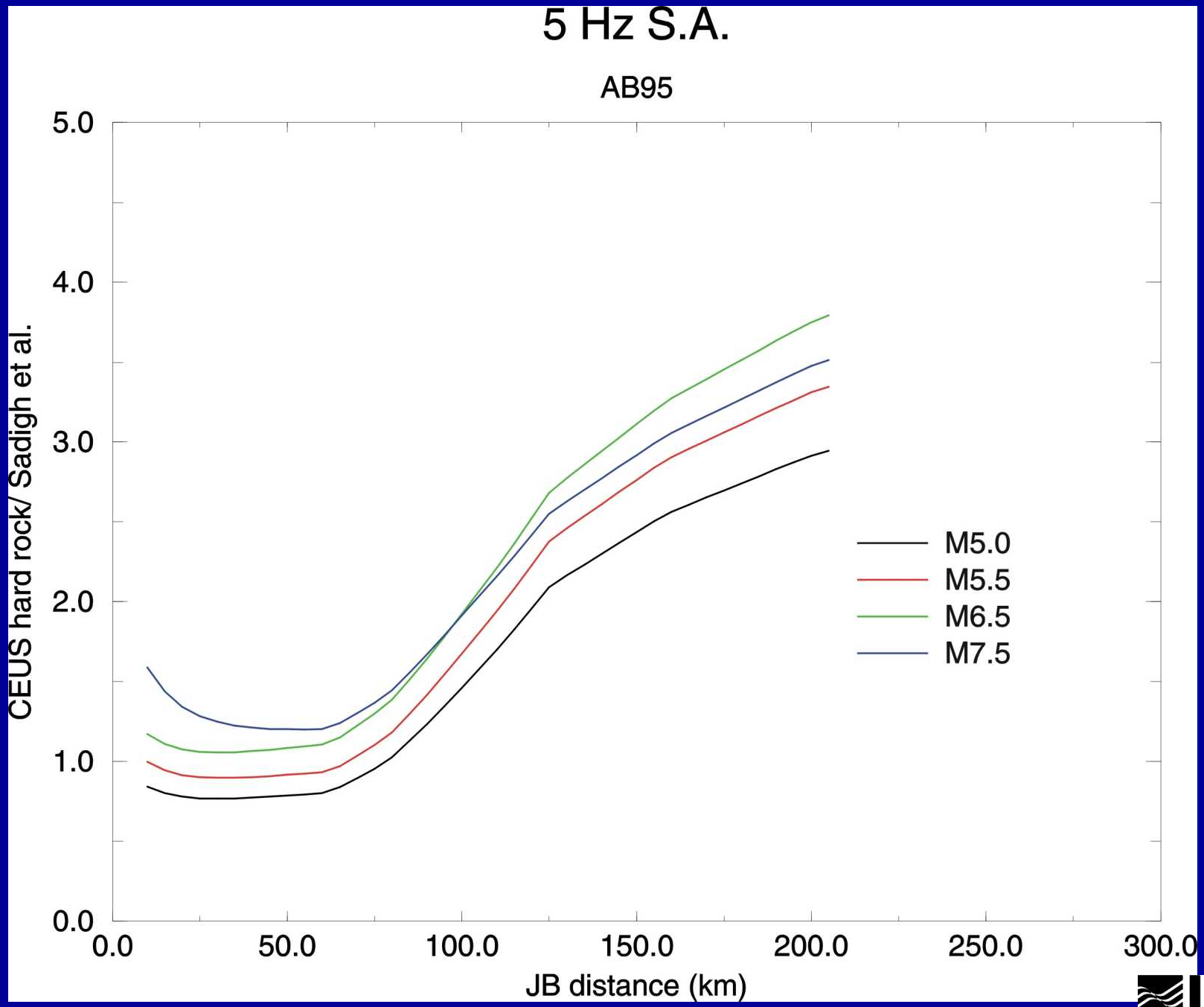


We used kappa=0.01 for CEUS B-C sites

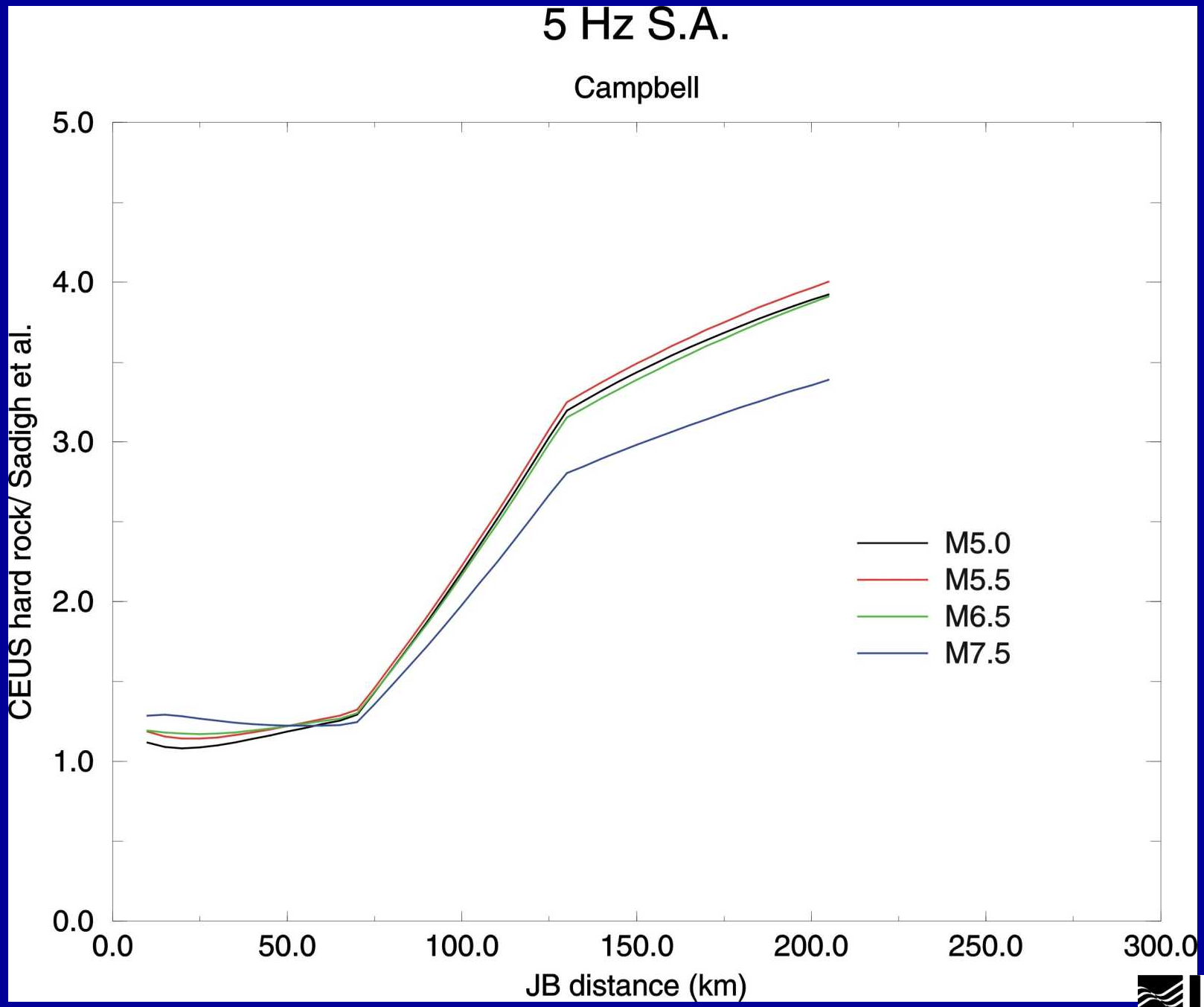
USGS science for a changing world



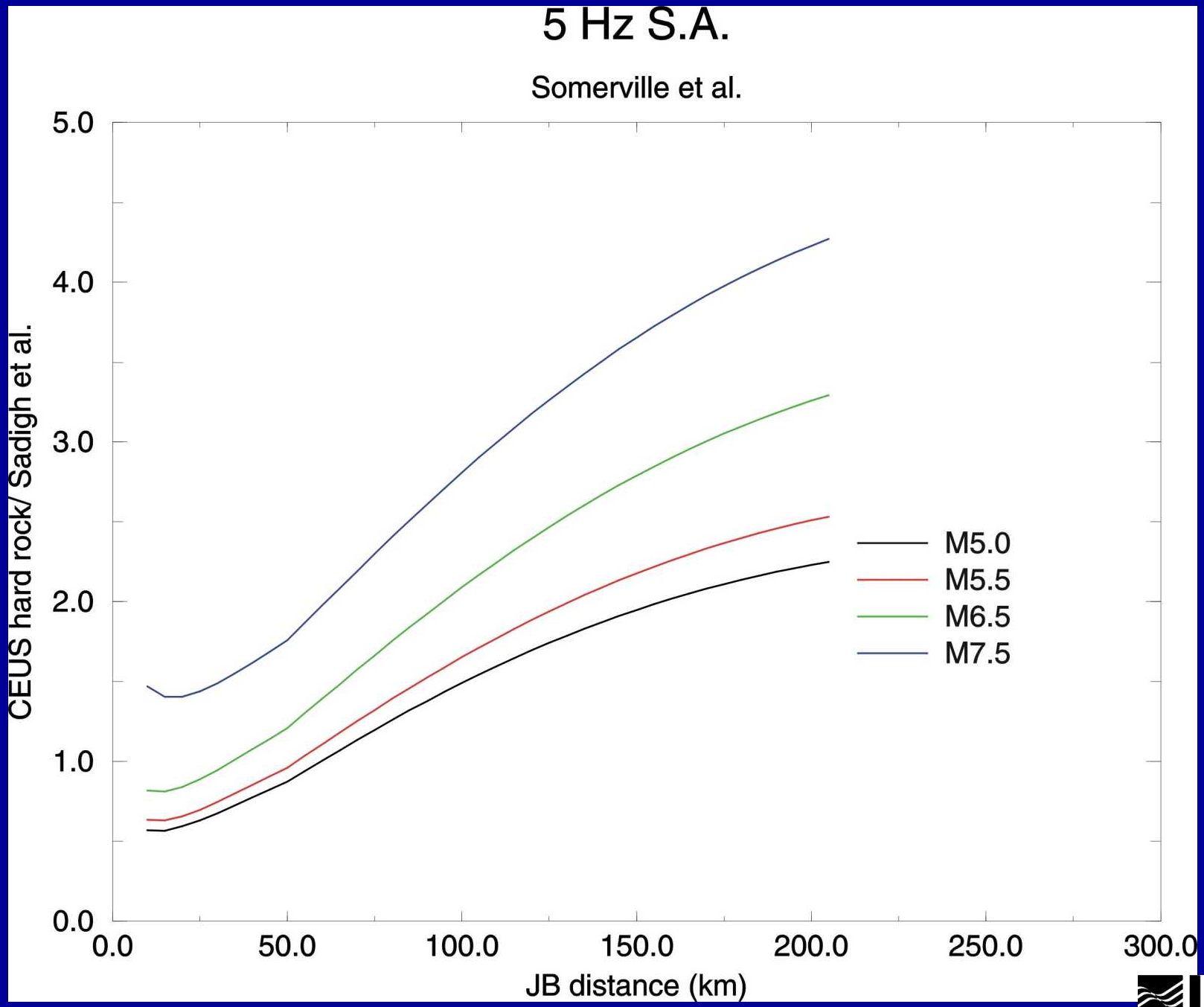
USGS
science for a changing world



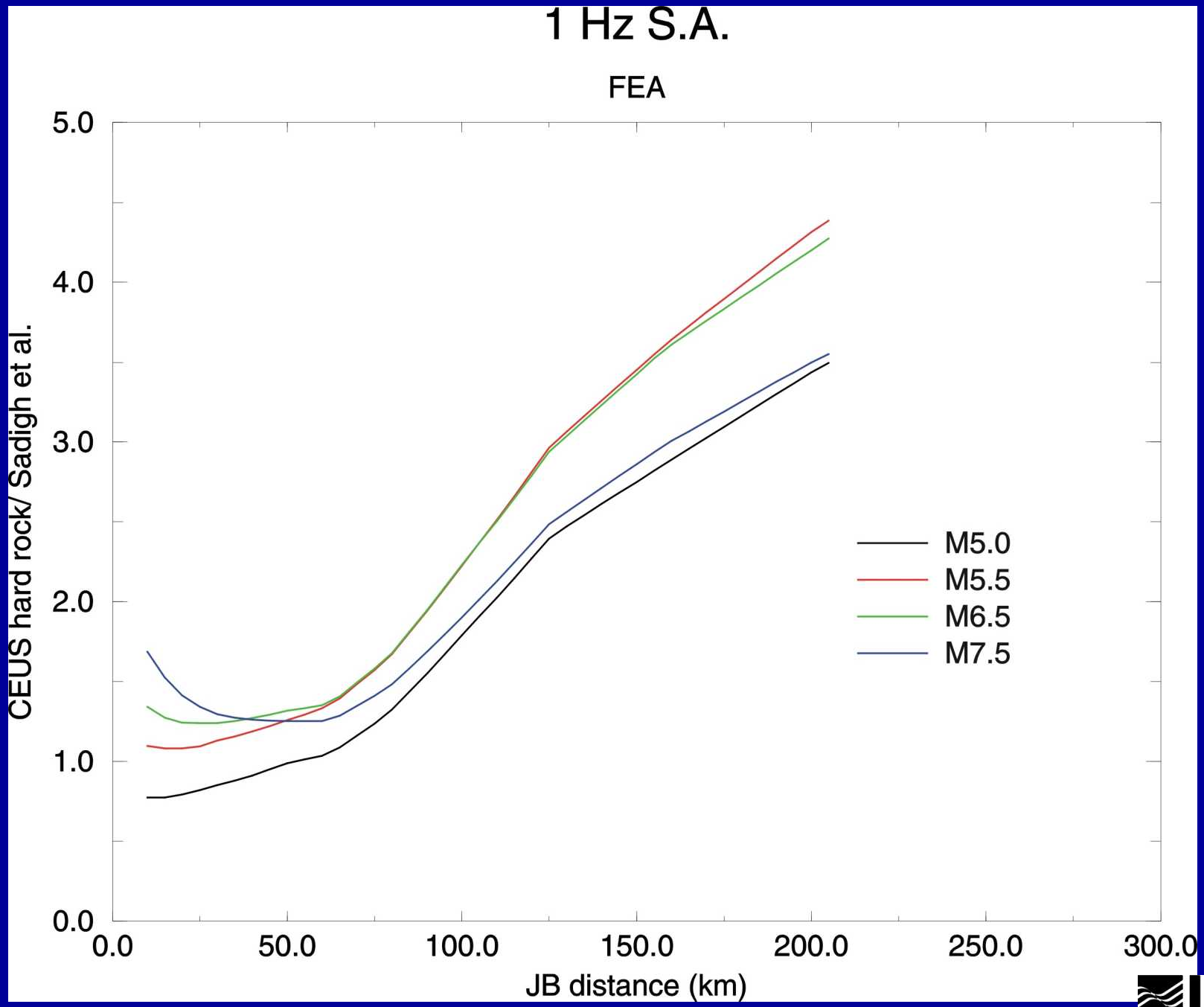
USGS
science for a changing world



USGS
science for a changing world



USGS
science for a changing world



USGS
science for a changing world

Proposed procedure for adjusting Frankel et al. (1996; FEA) point-source relations to account for finite sources

- Take ratios of spectral amplitudes of FEA with respect to NGA relations
- Adjust FEA values based on FEA/NGA for M 7.0 versus FEA/NGA for M5.0, so that curvature of ratios wrt distance at distances less than 75 km are similar for all magnitudes. Assumes extended sources are similar in length between WUS and CEUS, for a given magnitude.

USGS
science for a changing world