



## IMPLEMENTATION OF NGA-WEST2 GROUND MOTION MODELS IN THE 2014 U.S. NATIONAL SEISMIC HAZARD MAPS

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The U.S. National Seismic Hazard Maps (NSHMs) have been an important component of seismic design regulations in the United States for the past several decades. These maps present earthquake ground shaking intensities at specified probabilities of being exceeded over a 50-year time period. The previous version of the NSHMs was developed in 2008; during 2012 and 2013, scientists at the U.S. Geological Survey have been updating the maps based on their assessment of the “best available science,” resulting in the 2014 NSHMs. The update includes modifications to the seismic source models and the ground motion models (GMMs) for sites across the conterminous U.S. This presentation focuses on updates in the Western United States (WUS) due to the use of new GMMs for shallow crustal earthquakes in active tectonic regions developed by the Next Generation Attenuation (NGA-West2) project. Individual GMMs, their weighted combination, and their impact on the hazard maps relative to 2008 are discussed. In general, the combined effects of lower medians and increased standard deviations in the updated GMMs have caused only small changes, within 5-20%, in the probabilistic ground motions for most sites across the WUS compared to the 2008 NSHMs.

The WUS GMMs and their assigned weights used in the 2008 and the 2014 NSHMs are listed in Table 1 and Table 2, respectively. Figure 1 shows the median values of the GMMs for 0.2 s spectral acceleration plotted versus absolute value of distance,  $R_x$ , for magnitudes 5.0 (left) and 7.0 (right), where  $R_x$  is the horizontal distance from top edge of rupture measured perpendicular to the fault strike (it is positive over the hanging-wall and negative over the footwall). Figure 2 shows how standard deviations vary with magnitude at 0.2 and 1.0 s spectral periods. Standard deviation is not sensitive to faulting mechanisms, hanging-wall term, or distance for most models.

Table 1. WUS ground motion models and weights in the 2008 NSHMs

2008 GMM	Abbreviation	Weight
1. Boore and Atkinson (2008)	BA08	1/3
2. Campbell and Bozorgnia (2008)	CB08	1/3
3. Chiou and Youngs (2008)	CY08	1/3

Table 2. WUS ground motion models and weights in the 2014 NSHMs

2014 GMM	Abbreviation	Weight
1. Abrahamson et al. (2013)	ASK13	0.22
2. Boore et al. (2013)	BSSA13	0.22
3. Campbell and Bozorgnia (2013)	CB13	0.22
4. Chiou and Youngs (2013)	CY13	0.22
5. Idriss (2013)	I13	0.12

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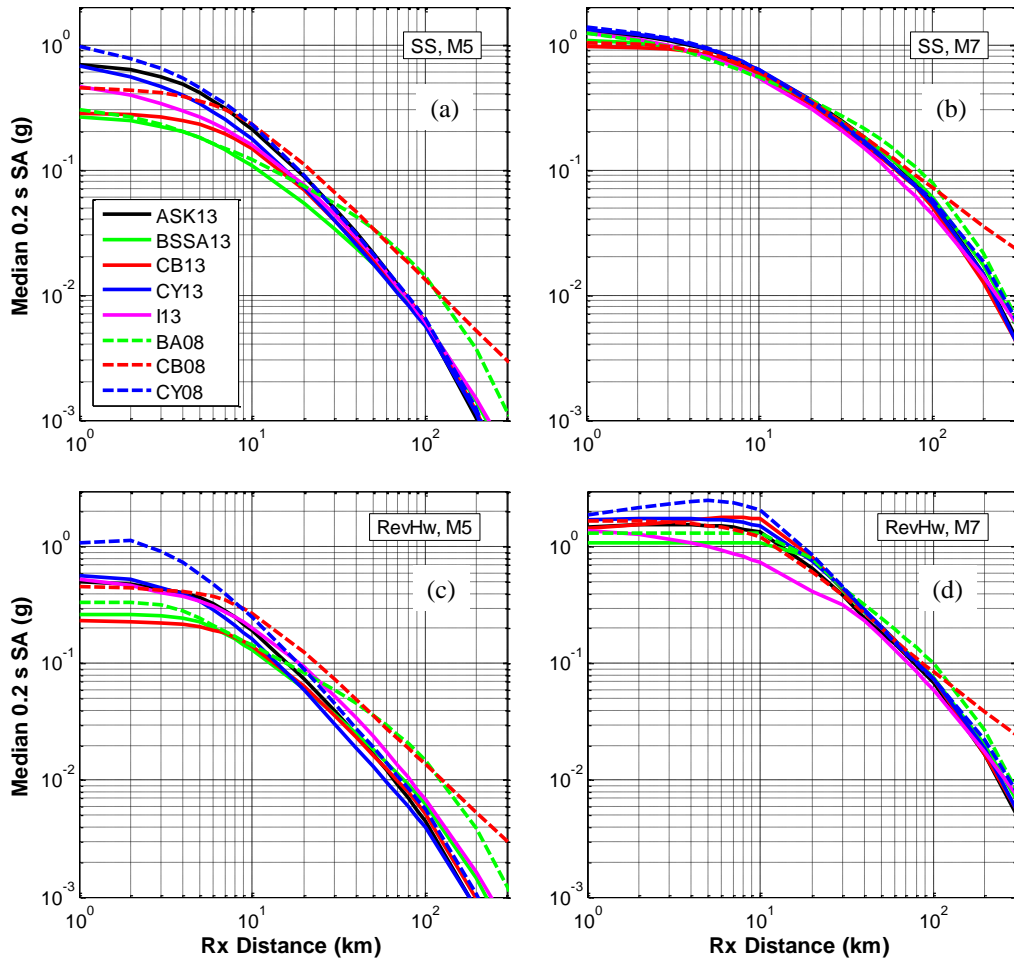


Figure 1. Median GMMs used in the 2008 and 2014 NSHMs at 0.2 s spectral period, plotted versus distance for a strike-slip fault (top) and over the hanging-wall side of a reverse fault (bottom), on a firm-rock site and for magnitudes of 5 (left) and 7 (right).

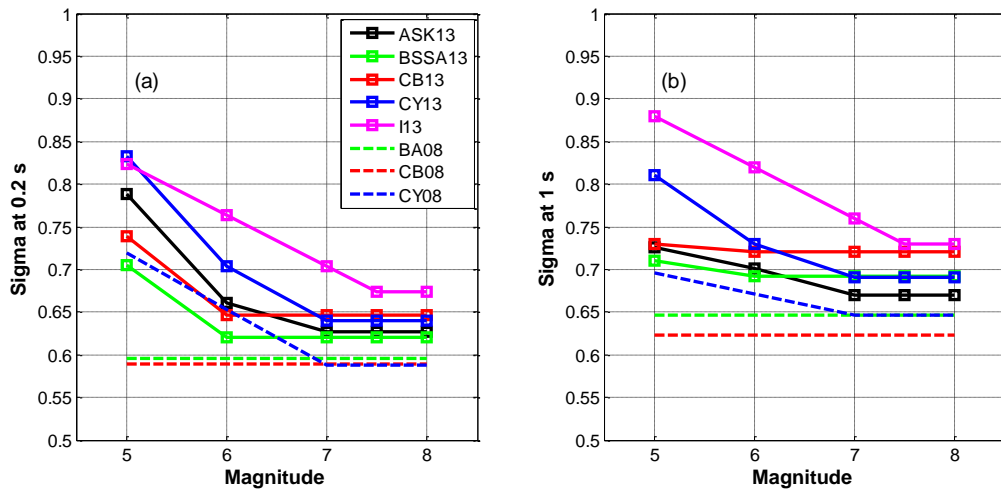


Figure 2. Standard deviations of GMMs used in the 2008 and 2014 NSHMs at 0.2 s (left) and 1.0 s (right) spectral periods, plotted versus magnitude. The plots are for a strike-slip fault at 10 km distance and firm-rock site conditions.

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