

USGS NSHMp Workshop

Limitations in the Zhao et al. 2006 GMPE for Japan

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Magnitude scaling

- The dataset includes the $M_w=8.3$ October 2003 event
- Magnitude scaling rate is probably still too high for large interface events $M_w=7.5+$
- The magnitude squared term did not do a good job
- The results from my recent study (Zhao & Xu 2012, BSSA) may be used to correct the magnitude scaling for large events

Magnitude scaling

- The positive magnitude squared term for slab events may lead to unrealistically high spectrum for large events
- There is a possibility that the positive magnitude squared term was caused by small and moderate events
- The 2006 model should produce reasonable results for slab events with $M_w < 7.5$

Path effect modelling

- Path effect modelling is too simple
- Too high prediction for shallow slab events because of a particular geometric attenuation term.
- This causes problem in NZ but possibly not in the other parts of the world

Wellington is just 20km above the slab!

Path effect modelling

- My recent work (Zhao 2010 BSSA) suggested that mantle wedge may have a very different anelastic attenuation rate from the shallow part of the interface.
- My recent work (Zhao 2010 BSSA) suggested that the geometric attenuation term for deep slab events is not as simple
- The model does not produce similar spectra from shallow slab events as to those from crustal events

Standard deviations

- Inter-event standard deviation should be appropriately separated into 3 parts according to event category
- The standard deviation for slab events is higher than for shallow crustal events, especially at long periods

Site effect

- Site conditions are reliable only for some sites and they are good only for site classes
- Hard rock site terms were derived from too few sites
- Volcanic front effect was not modelled
- No nonlinear site response terms and it is possible to tune them using nonlinear models from other GMPEs **with caution**

Questions/Answers

Interface models for Zhao et al 2006 (modified by Zhau and Xu, 2012)

Should we apply the magnitude-scaling rate to the 2006 model (especially for periods $> 0.5s$) even though the relation depends on Japan data and no other global data?

A possible solution - nothing else better!

Which of the three functions of magnitude (linear, bilinear, and curved) should we use?

The slope of the second linear segment?

Questions/Answers

Should we use the equation for site class (SC-I, rock $V_{s30} > 600$ m/s) conditions if we want to make a map with $V_{s30} = 760$ m/s or should we do something else?

SCI would be the approximate one.

What depths should we apply to the equation?

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**There are quick fixes but a set
of new models is the best option**

Thank you