USGS Workshop on Seismic Directivity:

Implementation within the National Seismic Hazard Model

Questions and Talking Points to Consider Prior to and During the Workshop

Day 1: Overview of Seismic Directivity Models

1) What type of models best characterize the physical mechanisms that are known to affect seismic ground motions and amplification?

2) Can we apply earlier NGA West 2 directivity models within a GC2 coordinate system?

3) What limitations of fault complexity can be used with existing models?

4) What are other options for centering DPP (for CS/CY) without using the racetrack approach?

Day 1: Directivity Model Implementations

1) How to model the hypocenter distribution on complex offset/discordant or multi-segment ruptures?

2) Considering the treatment of the GMM aleatory variability in PSHA. Since there is an implicit increase in variability when a directivity model is applied as a median adjustment with hypocenter variation, what are options to address this?

3) Can we take CS/CY ΔDPP function (Eq. 7 of CY14) and plug it into other NGA West 2 models (similar to what Watson-Lamprey 2018 does)? Does anything need to be adjusted (e.g., reduce φSS)

Day 2: PSHA Directivity Implementation

1) If we use local NZ data to adjust an NGA West 2 (or similar) model (e.g., stress term, anelastic attenuation, linear site term etc.), can we be sure that this model remains well-centered? How do we avoid accidentally de-centering it?

2) If modelling hypocenter position uncertainty explicitly, are we reducing φ enough? Should reductions in φ (and/or τ) be applied to the ground motion on bedrock before then applying the nonlinear amplification model? Does it matter?

3) Should we be using "global" hypocenter position distributions (e.g., Chiou & Youngs, 2018; Watson-Lamprey, 2018) and, if not, what sort of information and how much would be needed to define a fault-specific distribution?

Day 2: USGS NSHM Implementation

1) What kind of directivity approach would be most useful/reliable for end users?

2) How should directivity models be weighted in an epistemic approach, particularly in dip-slip situations, where significant differences arise between models? Should special consideration be given to

normal faulting events, that haven't been specifically modeled much? What about subduction zone events, treated separately or within their own class?

3) What level of complexity of fault models best combines the realistic earth model and practical implementation in PSHA codes?

4) Plan or procedure; implement a simpler model now (median/variability adjustment), with full hypocenter randomization approach in the coming years, in future NSHM updates?

5) To what extent to rely on synthetic data in situations where empirical data is minimal/ composite datasets?

6) Research versus policy maps implementation?

Day 2: Future Directions

1) Short-term vs. long-term goals

2) Role of synthetics and alternative techniques to validate results?

Day 2: Final Remarks

1) What can we do to refine the hypocenter distribution on a specific fault? What sort of information is needed and how much before we can move away from "global" distributions?

2) Are the models modifying sigma correctly (e.g., should we be applying reductions to motion on bedrock rather than at the surface)?

3) Can/should directivity models be applied to other types of sources besides active faults (e.g., background seismicity sources using virtual faults, subduction zones etc.)?

4) Models need to be updated to account for new coordinate system?

5) Method to show proof of reduction in uncertainty/better characterization of ground motion for use in future hazard/events? Other approaches to indicate this?