Ground Motion Simulations: needs for acceptance in practice

- Recently, the PEER Pacific Rim Forum addressed this topic in a two-day seminar
    - The agenda and many presentations are available here:
      https://peer.berkeley.edu/news-and-events/peer-international-pacific-rim-forum/full-program
- The discussions were split into two days:

Day 1 Core elements of regional - scale simulations	Day 2 – Building confidence in simulations and transition to engineering practice

• Earthquake Source Representation
 	
• Nonlinear structural / soil response
 	
• Geologic models to support high frequency simulations
 	
• Representing near-surface geotechnical layers
 	
• Geophysics / engineering model coupling
 	
• Computational considerations – integrated simulations workflow, performance and computational demands
	• Building confidence in regional-scale simulation tools
	  - Metrics and acceptance criteria for synthetic motions
	  - Characterization and propagation of uncertainties
	  - Verification and validation of simulation results
	• Transitioning to practice for Performance Based Earthquake Engineering
	  - What is the right phased approach?
	• Operational models for broadening community access – from R&D to community application

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PEER Lifelines summary of actions

Tangible action – PEER Lifelines working group on synthetic ground motions for PBEE

- Establish a clearer picture of what constitutes success for utilization of synthetic ground motions – and how to measure progress

- Develop a plan for characterization of uncertainty

- Identify early compelling use cases to evaluate PBEE utility (early success)

- Identify and promote PBEE requirements to the earth science community

- Promote accessibility to *appropriately vetted* synthetic motions

- Communicate the status of synthetic ground motions for PBEE to the stakeholder communities

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Norm Abrahamson's proposed short term plan of action

Tangible action – pilot a phased utilization of 3D-simulations in risk calculations

Learn by doing

	Prior to Implementation	**Simulations needed**
Phase 1	Initial validation of 3-D simulations for median path effects (allows for constant scale factor from data)	1-D and 3-D simulations for a limited set of scenarios
Phase 2	Complete validation of 3-D simulations for median (source and path)	1-D and 3-D simulations for a limited set of scenarios
Phase 3a	Complete validation of the aleatory variability for the region	Larger number of simulations - more scenarios
Phase 3b	Complete validation of the aleatory variability for the individual sites - do the 3-D simulations capture site-specific variability?	Larger number of simulations - More realizations for sigma at each site

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