

Forum Context

Regional scale simulations are at the forefront of PEER current & future directions:

- Very relevant use of PBEE technologies
- Truly achieving community resilience
- Functional recovery on all infrastructure levels

Pacific Rim Forum is important for PEER:

- Earthquake engineering community engagement
- Bringing together multidisciplinary expertise from structural and geotechnical engineering together with earth science
- Sharing research results as well as state-of-the-art & state-of-the-practice advancements
- Highlighting the 21st century technologies, particularly HPC & Data Science and their potential adoption in PEER activities)

Remarks from Day 1

General:

- Very good day overall with 25 presentations covering a range of specializations.
- Nice participation consisting of seismologists, structural and geotechnical engineers.
- Several students, researchers and practicing professionals participated.
- Excellent work by these researchers, professionals & scientists - the presentations were excellent.
- We made it through the day without any major technical glitches, Many thanks to Amarnath and the PEER staff.

Remarks from Day 1

Synthetic motions:

- Frequency content: Varying in different studies (up to 16 Hz), high frequency content difficult to produce: Higher resolution crust models needed, computation effort $\propto (f_{\max})^4$
- Possible to produce realistic pulse periods for near-fault motions.
- Use of ANN promising to complete the missing frequencies.
- One-to-one comparisons with recorded motions: Possible to capture PGA, PGV, and response spectra successfully (except for high frequencies).
- Synthetic motions generated for small, moderate, and large earthquakes + aftershocks.
- Duration needs improvement with more information from geological layers.

Geotechnical modeling:

- Geotechnical/SSI simulation tools available (e.g., <http://soilquake.net/>), which can be used along with synthetic motions, including implementations in OpenSees and Abaqus.
- Modeling of near-surface layers: Importance of soft soil (1985, 2017 Mexico, 1989 Loma Prieta) + nonlinear soil response.
- Collecting information from representative areas as collecting soil information from a large area can be quite costly.

Remarks from Day 1

Structural/regional scale simulations:

- Rupture to rafters. EQSIM: Simulation from earthquake rupture to the structural response of 3D structures.
- Couple ground motion simulations with exposure and fragility to estimate seismic risk at a city scale.
- Simulated motions applied to highway bridges with different types of validation achieved.
- Simulated motions to model and simulate seismic landslides.
- Social science simulations (e.g., traffic, economic or recovery simulations after earthquakes)
- Scalable solvers, algorithms + platform optimization and supercomputers for GM simulations
- Regional scale simulations for multi-hazards