

SCEC Ground Motion Simulation Validation (GMSV) Technical Activity Group

- SCEC is establishing a Technical Activity Group (TAG) focused on GMSV in order to develop and implement testing/rating methodologies via collaboration between ground motion modelers and engineering users
- The focus is on simulated strong ground motion time series

Possible Activities

- Research on important ground motion or structural (e.g., building) response parameters and statistics that should be used in comparing simulated versus recorded/historical ground motion time series
- Comparisons of simulated ground motions with empirical ground motion prediction equations, in terms of both median predictions and the variability about them (e.g. from CyberShake)
- Compilation of representative nonlinear structural models of different types for which the responses to simulated versus recorded time series can be compared

Possible Activities

- Comprehensive analysis and documentation of the sensitivity of simulated ground motions to model input parameters and their interactions and uncertainties
- Development of testing and/or rating metrics for simulated ground motions, perhaps considering testing concepts from the Collaboratory for the Study of Earthquake Predictability.
- Implementation of testing/rating methodologies into the SCEC Broadband Strong Motion Simulation Platform



Kickoff/Planning Workshop – Jan 11, 2011

Agenda, Part 1

What Ground Motion Simulations/Models to Validate?

SCEC Broadband Simulation Platform & Cybershake (Graves)

Puente Hills, ShakeOut, 1906, & Hayward Simulations (Aagard)

Summary of Other GM Simulation Models (Somerville/Zeng)

Agenda, Part 2

What Validation Methodologies? What Engineering Applications?

Goodness-of-Fit Criteria (Olsen)

Elastic & Inelastic Response Spectra Properties (Baker)

Spatial Correlation of Spectral Accelerations (Bazzurro/Jayaram)

Attenuation of Spectral Accelerations (Stewart)

Tall Building Response (Jayaram)

Summary of Other Validation Methodologies/Applications (Luco)



Agenda, Part 3

Initial Priorities for GMSV Technical Activity Group (TAG)

What Engineering Applications? (All)

What Validation Methodologies? (All)

What Ground Motion Simulations/Models to Validate? (All)

Archiving/Distribution of GM Simulations? (All)

Implementation of Validation Methodologies? (All)

TAG Organization/Approach? (All)

What Engineering Applications?

- Elastic response spectra (a.k.a. linear SDOF model of building) – easy to do
- Inelastic response spectra (nonlinear SDOF model) – also easy to do
 - With or without static and/or cyclic deterioration
 - Can use OpenSees software
- Realistic MDOF nonlinear building models – hard – do later (for the most part)

What Validation Methodologies?

- Compare recorded (historical) and simulated time series via important ground motion parameters (e.g. elastic response spectra)
- Compare both simulated and recorded ground motions with prediction equations (a model comparison, not a true validation)
- Subtle features such as correlation structure across spectral periods or spatially may be important

What Ground Motion Simulations/Models to Validate?

- Simulations are needed to extrapolate to larger magnitudes and closer distances than are abundant in the recorded data base
- Simulations are also needed for specific geometries (e.g. basins) that are difficult to replicate in the recorded data base
- So validate against past recorded earthquakes, demonstrating ability to replicate observed magnitude scaling, then extrapolate / interpolate to other conditions
- Use both 3D (closer to reality) and 1D (more commonly used) velocity models, and make comparisons