

EARTHQUAKE SIMULATION: FROM RUPTURE TO VIRTUAL CITY RESPONSE

***Jacobó Bielak¹, Ricardo Taborda², Leonardo Ramírez-Guzmán³, and Antonio Fernández⁴**

^{1,2,3} Carnegie Mellon University
Pittsburgh PA, 15213, USA
jbielak@cmu.edu,
ricardotaborda@gmail.com
lramirez@andrew.cmu.edu

⁴Paul C. Rizzo Associates, Inc.
105 Mall Blvd. Suite 270-E
Monroeville PA, 15146, USA
antonio.fernandez@rizzoassoc.com

Key Words: *wave propagation, earthquake ground motion, city response*

ABSTRACT

Seismic hazard analysis provides the conceptual and computational framework for current work in earthquake system science and engineering. A major goal is to implement physics-based analyses that correctly model the complete earthquake process, from the source rupture through the wave propagation path to the response of the entire built environment in the affected region. Numerical simulations of ground motion play a vital role in this area of research. As part of an NSF/ITR project of the Southern California Earthquake Center we have developed a collaboratory to simulate earthquake processes using high-performance computing facilities and advanced information technologies—the SCEC Community Modeling Environment. This presentation will illustrate the CME capabilities with the “ShakeOut” simulation [1], a large scenario earthquake in southern California, developed to help engineers and government officials in their earthquake design and disaster planning and management efforts. We then describe how we are starting to use the knowledge of the ground motion over an entire earthquake-prone region toward petascale simulation of urban earthquake impacts.

REFERENCES

- [1] R. Taborda, L. Ramírez-Guzmán, J. López, J. Urbanic, J. Bielak, and D. O’Hallaron, “Shake-Out and its Effects in Los Angeles and Oxnard Areas”, *Eos Trans. AGU* 88(52), Fall Meet. Suppl., Abstract IN21B-0477, 2007.
- [2] A. Fernández-Ares and J. Bielak, “Urban Seismology: Interaction between Earthquake Ground Motion and Multiple Buildings in Urban Regions,” Proc. 3rd International Symp. On the Effects of Surface Geology on Seismic Motion, 87-96 Laboratoire Central de Ponts et Chaussées, Grenoble, France, 2006.