**ERC Connectivity Project Assessment**

A publication by Gregory Fenves (now the President of the University of Texas, Austin), who was one of the co-PIs and a Professor at the University of California, Berkeley, and his student, Georgios N. Petropoulos, points to the importance of this project for earthquake engineering and the contributions made by integrating the three capabilities. The abstract for a conference proceedings states: “Recent advances in the large-scale simulation of urban regions, including source and path effects, coupled with a dense spatial resolution of simulations of building response in the region of interest, provided insight into near-fault effects on building response not available from recorded data or small-scale simulations. The regional simulations to date have not included local site response effects or soil-structure interaction. These effects are addressed in refined simulations of a portion of a sub-region that includes an idealized three-dimensional, horizontally layered soil, along with a simplified model of a building and foundation on the surface. To perform simulations of a sub-region, the Domain Reduction Method (DRM) is used to define the seismic input motion and a mixed explicit-implicit (mE-I) time integration method is used because of the different physics of wave propagation in the soil and vibration of the structure. The simulations involve considerable computational challenges. New parallel computing procedures have been developed for scalable computation. Using an approximately one and one-half million element mesh for the soil region, the preliminary simulation results provide important insights into soil-structure interaction and site response effects.”[[1]](#footnote-1)

The conclusions indicate that, “The multi-scale simulation method using the Domain Reduction Method provides an efficient approach for the simulation of site response and soil-structure interaction effects. The preliminary simulations using a nonlinear SDOF system demonstrate the effects of kinematic and inertial interaction. A new implementation of implicit-explicit time integration provides a scalable computational procedure for soil/structure interaction simulation using parallel computers. The computational cost is identical or almost identical to that for large-scale explicit computations, for small enough implicit subdomains. Such simulations provide important insight into the complex phenomena of interaction, but they can rarely be used as part of regular engineering design and analysis procedures. However, progress in multicore processor technology as well as the increasing availability of parallel computing services such as Amazon Web Services and IBM Grid, render such solutions increasingly attractive for performing large-scale SFSI simulations.”[[2]](#footnote-2)

1. Petropoulos, Georgios N., Gregory L. Fenves (2008) *Large-Scale Simulation of Soil-Structure Interaction on Building Response in a Region*. The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China. http://www.14wcee.org/Proceedings/files/14-0061.PDF [↑](#footnote-ref-1)
2. Ibid. [↑](#footnote-ref-2)