Contaminant transport simulations using a GPU accelerated random walk particle tracking method

Calogero B. Rizzo (1), Felipe P.J. de Barros (1), Ken-Ichi Nomura (2), and Aiichiro Nakano (3)

(1) University of Southern California, Sonny Astani Department of Civil and Environmental Engineering, Los Angeles, United States, (2) University of Southern California, Mork Family Department of Chemical Engineering and Materials Science, Los Angeles, United States, (3) University of Southern California, Department of Computer Science, Los Angeles, United States

Stochastic interpretation of contaminant transport in field scale porous media usually requires a huge computational effort. Common methods, such as Monte-Carlo based approaches, require the simulation to be carried out over several realizations of the flow and transport problem. Depending on the parameters, the number of realization needed for the statistical convergence of a given quantity of interest may be very high. Broad adoption of stochastic methodologies must be accompanied by fast and efficient tools. We have developed a random walk particle tracking method for contaminant transport that is GPU accelerated. The code is developed using C++/CUDA programming language. Using the extremely parallel nature of the particle tracking method, it is possible to simulate the contaminant transport in a fraction of the time that other common non-parallelized computational tools need.