

**Stony Brook University
The Graduate School**

Doctoral Defense Announcement

Abstract

Lattice Boltzmann Simulation of Immiscible Two-Phase Flow
in Three Dimensional Porous Media

By

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Multiphase flow in porous media at pore scale is of major interest in oil recovery, degradation of building materials, the spread of hazardous wastes in the ground, contaminant remediation in aquifers, and the containment of nuclear wastes. The challenges in simulating two-phase flow in a porous media are its geometrical complexity and the vastness of the physical parameters to be incorporated in the model.

Unlike traditional computational schemes, lattice Boltzmann model uses particle distribution functions to solve macroscopic quantities such as density and velocity. These fluid particles collide with particles of their own type, other fluid particles and an obstacle under external body force. No-slip bounce back boundary condition is used for fluid particles encountering an obstacle and periodic boundary condition is used for particles at the inlet-outlet of the boundary. Shan-Chen interaction potential is employed to handle the interface between the two phases.

Prediction of relative permeabilities as a function of resident fluid saturation which are inherent features of the porous media are computed using Darcy's law and compared to experimental results. The effects of different viscosities, pressure gradient and fluid-fluid interaction constants in the fluid flow analysis are studied extensively.

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Time: 11:00AM

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Program: Applied Mathematics and Statistics

Dissertation Advisor: Prof. W. Brent Lindquist