Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

A hybrid immersed boundary-lattice Boltzmann/finite difference method for coupled dynamics of fluid flow, advection, diffusion and adsorption in fractured and porous media XU YU, KLAUS REGENAUER-LIEB, School of Minerals and Energy Resources, UNSW Sydney, Australia;, FANG-BAO TIAN, School of Engineering and Information Technology, UNSW Canberra, Australia; — Gas transport coupled with solid-fluid mass transfer is an important mechanism in porous media. Gas adsorption on the solid surface of the pores occurs in many fields of science and engineering. Geoscience applications include CO2 sequestration, energy storage, and especially coal bed methane (CBM) recovery. There exists to date no suitable method for modelling gas adsorption at pore scale level for cases where adsorption/desorption is the dominant mechanism for gas transfer. One important factor for the lack of a suitable computational tool to investigate the kinetics is that the gas adsorption is a multiscale process covering the micro-, meso-, and macroscale. Lattice Boltzmann Method (LBM) as a mesoscopic method has the advantage of offering a bridge between the physics of microscopic and macroscopic scales. This advantage led us to select LBM as a suitable method for the numerical discretization of macroscopic equations. In this paper, a hybrid immersed boundary-lattice Boltzmann/finite difference method is extended to simulate the coupled dynamics of fluid flow, advection, diffusion and adsorption in fractured and porous media. The numerical method includes three important components: fluid solver, advection-diffusion solver, and immersed boundary method for fluid-solid interaction with coupled mass exchange. In the fluid solver, the single-relaxation time lattice

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Date submitted: 12 Jun 2018 Electronic form version 1.4