Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Urban Flow and Pollutant Dispersion Simulation with Multi-scale coupling of Meteorological Model with Computational Fluid Dynamic Analysis YUSHI LIU, HEE JOO POH, Institute of High Performance Computing — The Computational Fluid Dynamics analysis has become increasingly important in modern urban planning in order to create highly livable city. This paper presents a multi-scale modeling methodology which couples Weather Research and Forecasting (WRF) Model with open source CFD simulation tool, OpenFOAM. This coupling enables the simulation of the wind flow and pollutant dispersion in urban built-up area with high resolution mesh. In this methodology meso-scale model WRF provides the boundary condition for the micro-scale CFD model OpenFOAM. The advantage is that the realistic weather condition is taken into account in the CFD simulation and complexity of building layout can be handled with ease by meshing utility of OpenFOAM. The result is validated against the Joint Urban 2003 Tracer Field Tests in Oklahoma City and there is reasonably good agreement between the CFD simulation and field observation. The coupling of WRF- OpenFOAM provide urban planners with reliable environmental modeling tool in actual urban built-up area; and it can be further extended with consideration of future weather conditions for the scenario studies on climate change impact.

Yushi Liu
Institute of High Performance Computing

Date submitted: 26 Jul 2014 Electronic form version 1.4