Abstract Submitted for the DFD09 Meeting of The American Physical Society

Large Eddy Simulations of boundary layer flow over fractal trees¹ JASON GRAHAM, Johns Hopkins University, CHARLES MENEVEAU, Mechanical Engineering and Center for Environmental and Applied Fluid Mechanics, Johns Hopkins University — A large-eddy simulation (LES) of flow over a canopy of fractal trees in the atmospheric boundary layer (ABL) is performed. The fractal trees provide complex boundary- turbulence interactions while maintaining tractable characteristics that can be systematically studied. LES are performed using the immersed boundary method following the implementation of Chester et al. (2007, J. Comp. Phys.). Simulations are performed for each fractal generation and the Reynods stresses and drag forces are computed. The LES results are used to analyze the impact of multiscale geometry on the Reynolds stress distribution and drag forces as a function of the generation number. This effort is also a feasiblity study for Renormalized Numerical Simulations (RNS) which is a methodology that allows for drag forces of unresovled generations to be computed by combining renormalizing techniques with the information from the resolved generations. Results are used to gain insight on scaling relationships between the drag forces and the generation number, and ultimately lead to better renormalization techniques for RNS.

¹This research is supported by NSF (IGERT on Complex Systems), as well as NSF - ATM 0621396.

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Date submitted: 10 Aug 2009 Electronic form version 1.4