Abstract Submitted for the DFD07 Meeting of The American Physical Society

Modeling particle deposition in a turbulent ribbed channel flow¹ AMIRUL KHAN, XIAOYU LUO, University of Glasgow, FRANCK NICOLLEAU, University of Sheffield, PAUL TUCKER, University of Wales, GIOVANNI LO IA-CONO, Rothamsted Research — Transport and deposition of aerosol particles in a plane channel with a ribbed wall are studied to investigate the effects of turbulent flow structures on particle deposition. In this paper, kinematic simulation (KS) has been adapted to be a sub-grid model for particles, in conjunction with large eddy simulation (LES) simulation in real space. KS is a Lagrangian model of turbulent dispersion that takes into account the effects of spatio-temporal flow structure on particle dispersion. It is a unified Lagrangian model of one-, two- and indeed multiparticle turbulent dispersion and can easily be used as a Lagrangian sub-grid model for LES code thus enabling complex geometry to be taken into account. To study the effect of small scale flow structures on particle deposition in the ribbed channel flow we use a validated LES code to simulate the flow field, and KS to model the sub-grid flow structures. Comparing our results with published experimental data suggest that the particle deposition in the ribbed channel can be greatly affected by the small-scale (sub-grid) turbulent flow structures.

¹Engineering and Physical Sciences Research Council

Amirul Khan University of Glasgow

Date submitted: 30 Jul 2007

Electronic form version 1.4