Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Time dependent ventilation flows driven by opposing wind and buoyancy IMRAN COOMARASWAMY, DAMTP, University of Cambridge, COLM CAULFIELD, BPI & DAMTP, University of Cambridge — We consider flow in an enclosure containing an isolated heat source, ventilated by a windward high level opening and a leeward low level opening, so that prevailing wind acts to oppose buoyancy driven flow. Following the "emptying filling box" approach of Linden *et al.*[1], Hunt & Linden[2] demonstrate that multiple steady states can exist above a critical wind strength. We develop time dependent models for this system and apply them to an initial value problem - box filling with constant opposing wind. We identify the final state attained for any given heat load, wind strength and vent size. We note that the interface between the upper region of hot plume fluid and the lower region of cool ambient air can dramatically overshoot its final level before relaxing to equilibrium; in some cases, a fully mixed transient can occur before the stratified steady state is reached. Analogue laboratory experiments confirm the existence of these transient phenomena and elucidate the range of validity of our predictions.

[1]Linden, Lane-Serff & Smeed, *J. Fluid Mech.* **212**, 309 (1990).
[2]Hunt & Linden, *J. Fluid Mech.* **527**, 27 (2005).

Imran Coomaraswamy
DAMTP, University of Cambridge

Date submitted: 03 Aug 2008 Electronic form version 1.4