Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Turbulent diffusion from a heated line source in non-equilibrium grid turbulence[1] JOVAN NEDIC, STAVROS TAVOULARIS, University of Ottawa — We have investigated turbulent diffusion of heat injected passively from a line source in equilibrium and non-equilibrium grid-generated turbulence, which are, respectively, flows in which the value of the non-dimensional rate of kinetic energy dissipation is constant or changes with streamwise distance from the grid. We used three grids with uniform square meshes and one fractal square grid (FSG), all of the same solidity, to generate non-equilibrium and equilibrium turbulence in a wind-tunnel. The regular grids have mesh sizes that are comparable to the first (RG160), second (RG80) and fourth (RG18) iterations of the fractal grid. The heated line source was inserted on the centre-plane of the grids at either of two downstream locations or an upstream one and it spanned the entire width of the wind-tunnel. We found that RG160 produced the greatest heat diffusion, followed by FSG, RG80 and RG18, in this order. The apparent turbulent diffusivity produced by the four grids also decreased in the same order. These findings conform with Taylors theory of diffusion by continuous movements. Moreover, the present study demonstrates that the fractal space-scale unfolding (SSU) mechanism does not apply to grids with the same solidity but different effective mesh sizes.

[1]Supported by NSERC

Jovan Nedic
University of Ottawa

Date submitted: 20 Jul 2015 Electronic form version 1.4