Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Spectral models of strongly inhomogeneous turbulence ANDREW BRAGG, SUSAN KURIEN, Los Alamos Natl Lab, TIMOTHY CLARK, University of New Mexico — We compare results from a spectral model for inhomogeneous turbulence (Besnard et al., Theor. Comp. Fluid. Dyn., vol. 8, pp 1-35, 1996) with DNS data of a shear-free mixing layer (SFML) (Tordella et al., Phys. Rev. E, vol. 77, 016309, 2008). The SFML is used as a test case in which the efficacy of the model closure for the physical-space energy transport can be tested in a flow with strong inhomogeneity, without the additional complexity of mean-flow coupling. The model is able to capture certain features of the SFML quite well for intermediate to long-times, including the evolution of the mixing-layer width and turbulent kinetic energy. At short-times, and for more sensitive statistics such as the generation of the velocity field anisotropy, the model does not work so well. It may be argued that the discrepancy arises due to the local approximation to the intrinsically non-local pressure transport in physical-space, the effect of which would be particularly strong at short-times when the inhomogeneity of the SFML is strongest. Motivated by these results, we briefly discuss a new model that captures the non-local transport effects, for arbitrarily strong inhomogeneities of the flow.

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Date submitted: 30 Jul 2015 Electronic form version 1.4