**Modeling and simulation of turbulence not at statistical equilib-
rium** ARASH NOURI GHEIMASSI, PEYMAN GIVI, WILLIAM LAYTON, Univ
of Pittsburgh — Standard eddy viscosity models, while popular, cannot represent
backscatter and have severe difficulties with complex turbulence not at statistical
equilibrium. In this work, we give a derivation of eddy viscosity models from an
equation for the evolution of variance in a turbulent flow showing how to correct
eddy viscosity models. We show the corrected models preserve important features
of the true Reynolds stresses and give algorithms for their discretization including a
minimally invasive modular step to adapt an eddy viscosity computational method-
ology to the extended models. A numerical test is given with the usual and over
diffusive Smagorinsky model. The consistency and the predictive capability of the
model are established by conducting LES of a three-dimensional compressible mix-
ing layer, and comparison with DNS data. The correction does exhibit intermittent
backscatter.

Arash Nouri Gheimassi
Univ of Pittsburgh

Date submitted: 31 Jul 2016   Electronic form version 1.4