Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Coarse Projective Integration of a One-Dimensional Turbulence Model ANNE STAPLES, ALEXANDER SMITS, YANNIS KEVREKIDIS, Princeton University — Multiscale methods may be useful in turbulence if we choose the correct level of description of the problem. A typical turbulent velocity field has continua of length and time scales and hence is not amenable to Multiscale methods. The energy spectrum variables, however, exhibit a separation of time scales. Consider a box of fluid, shaken. The energy spectrum will immediately fill out, but the $k^{-\frac{5}{3}}$ character of the intermediate wave numbers and the rest of the overall shape of the spectrum will fill out slowly over time. In this work we apply a Multiscale method, Coarse Projective Integration (CPI), to the simulation of a one-dimensional turbulence model, the MMT equation. We find a significant saving in computational (wall clock) time using CPI, compared to using standard direct numerical (DNS) simulation procedures, $\frac{\mathrm{T}_{DNS}}{\mathrm{T}_{CPI}} = 4.78$, where T_{DNS} is the wall clock time using DNS and T_{CPI} is the wall clock time using CPI.

Alexander Smits
Princeton University

Date submitted: 04 Aug 2005 Electronic form version 1.4