Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Coherent Vortex Simulations of 3D isotropic turbulence[1] DANIEL E. GOLDSTEIN, Northwest Research Associates, Inc., CORA Division, OLEG V. VASILYEV, University of Colorado at Boulder, NICHOLAS K.-R. KEVLAHAN, McMaster University, Canada — This is the first of three talks on the wavelet filter based dynamically adaptive eddy capturing computational methodology that unifies variable fidelity simulation approaches such as wavelet-based DNS, Coherent Vortex Simulation (CVS), and Stochastic Coherent Adaptive Large Eddy Simulation. The commonality of these approaches is their ability to identify and "track" on an adaptive mesh energetic coherent vortical structures. In CVS the velocity field is decomposed into two orthogonal parts: a coherent, inhomogeneous, non-Gaussian component and an incoherent, homogeneous, Gaussian component. This separation of coherent and incoherent components is achieved by wavelet thresholding which can be viewed as a non-linear filter that depends on each flow realization. The essence of the CVS approach is to solve for the coherent non-Gaussian component of a turbulent flow field. It has been shown previously that second generation bi-orthogonal wavelet threshold filtering is able to decompose a turbulent velocity field such that the total resulting SGS dissipation is approximately zero. This physically allows a CVS simulation to recover low order statistics with no SGS model. In this work CVS simulations of decaying incompressible 3D isotropic turbulence are compared to DNS results.

[1]This work was partially supported by DOE, NSF, and NASA.

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Date submitted: 07 Aug 2006 Electronic form version 1.4