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Coherent Vortex Simulations of linearly forced homogeneous turbulence[1] OLEG V. VASILYEV, University of Colorado at Boulder, DANIEL E. GOLDSTEIN, Northwest Research Associates, Inc., CORA Division, GIULIANO DE STEFANO, Seconda Universitá Napoli, Italy — This is the first of two talks on the wavelet based eddy capturing computational methodology that is capable of identifying and tracking on an adaptive mesh energetic coherent vortical structures in a turbulent flow field. This talk focuses on Coherent Vortex Simulations (CVS) approach, where the velocity field is decomposed into two 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. The results of Coherent Vortex Simulations of linearly forced incompressible 3D homogeneous turbulence for different Reynolds numbers demonstrated that CVS with no SGS model is capable to recover not only low order statistics, but also energy and, more importantly, enstrophy spectra up to the dissipative wavenumber range.

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