Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Extraction of coherent vortices from high resolution DNS of homogeneous isotropic turbulence MARIE FARGE, Ecole Normale Superieure, Paris, KAI SCHNEIDER, Universite de Provence, KATSUNORI YOSHIMATSU, NAOYA OKAMOTO, YUKIO KANEDA, University of Nagoya — We have proposed a wavelet-based algorithm to extract coherent vortices out of turbulent flows. Since there is not yet a well-accepted definition of coherent structures for 3D flows, we suppose that they are what remains after denoising. Our *prior* is not on the structures themselves but on the noise, that we assume, as the simplest hypothesis, to be Gaussian and white. We apply this algorithm to several 3D homogeneous and isotropic turbulent flows forced at large scale and computed by DNS for different Taylor micro-scale Reynolds numbers, ranging from $R_\lambda = 167$ with resolution $N = 256^3$ to $R_\lambda = 732$ with resolution $N = 2048^3$. We found that the compression rate increases with R_λ, *i.e.*, the number of coefficients necessary to represent the coherent vortices drops from $3.6\%N$ for $R_\lambda = 167$ to $2.6\%N$ for $R_\lambda = 732$. The coherent vortices thus extracted contribute to about 99% of the total energy and about 80% of the total enstrophy. The corresponding coherent energy spectrum has the same $k^{-5/3}$ power-law behavior as the total energy, which corresponds to long-range correlation. In contrast, the incoherent energy scales in k^{+2}, which corresponds to decorrelation. We conjecture that discarding the incoherent flow is sufficient to model turbulent dissipation, as done in CVS (Coherent Vortex Simulation, see http://wavelets.ens.fr).

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Date submitted: 11 Aug 2005 Electronic form version 1.4