Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Direct Numerical Simulations of Homogeneous Turbulent Shear Flow with Initial Mean Helicity FRANK JACOBITZ, University of San Diego, KAI SCHNEIDER, Universite de Provence, Marseille, WOUTER BOS, Ecole Centrale de Lyon, MARIE FARGE, Ecole Normale Superieure — Direct numerical simulations of homogeneous turbulent shear flows are performed in order to investigate the impact of mean helicity imposed on the isotropic initial conditions. As the flows are advanced in time, exponential growth of the turbulent kinetic energy is found after flow anisotropy has developed. The mean helicity, however, is observed to decay due to the symmetry properties of the flow. Distributions of helicity are observed to be skewed according to its initial value. A wavelet-based scale-dependent analysis shows that this skewness is largest for large scales of the turbulent motion and decreases for smaller scales. In addition, a trend to two-dimensionalization for large scales of motion and a preference for helical motion at small scales is found. Joint probability distribution functions show a strong correlation of the signs of helicity and super-helicity for all cases, including Gaussian random fields. This correlation supports the conjecture that super-helicity dissipates helicity.

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Date submitted: 01 Aug 2011 Electronic form version 1.4