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Convergence of third-order velocity structure functions in axisymmetric turbulence FABIEN GODEFERD, LMFA UMR 5509 CNRS, Ecole Centrale de Lyon, ALEXANDRE DELACHE, LMFA Université Jean Monnet, Saint-Etienne — Kolmogorov theory (1941) for isotropic turbulence establishes asymptotic scaling laws for the statistics of n-th order structure functions at high Reynolds number, in terms of dissipation ϵ and separation distance r for the velocity increment δu. A famed relationship is the -4/5 law. When the turbulent flow is anisotropic, due to external distortions (background rotation,...) to inhomogeneities or initial conditions (jets, "isotropic" grid turbulence), such laws may fail. We examine the applicability of the K41 predictions for third-order moments of velocity structure functions, and evaluate low Reynolds number effects and anisotropic effects on the departure with the -4/5 law. We consider rotating or stably stratified turbulence, whose statistics are obtained by Direct Numerical Simulations or by a two-point statistical model allowing to reach high Reynolds numbers. We link anisotropic spectral statistics for energy transfer with $< (\delta u)^3 >$ and derive physical space statistics from spectral data of the statistical model. Although K41 scalings may arguably not apply to anisotropic turbulence, some justifications for anisotropic turbulence statistics can be provided (Taylor et al. PRE 2003) by specific data processing in DNS.

Fabien Godeferd
LMFA UMR 5509 CNRS

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