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Small scale anisotropy in shear turbulence CARLO MASSIMO CASCIOLA, RENZO PIVA, PAOLO GUALTIERI, Dipartimento di Meccanica e Aeronautica, Universita' di Roma La Sapienza, BORIS JACOB, INSEAN — Recent developments in turbulence are focused on the effect of large scale anisotropy on the small scale statistics of velocity increments. According to Kolmogorov, isotropy is recovered in the large Reynolds number limit as the scale is reduced and, in the so-called inertial range, universal features - namely the scaling exponents of structure functions - emerge clearly. However this picture is violated in a number of cases, typically in the high shear region of wall bounded flows. The common opinion ascribes this effect to the contamination of the inertial range by the larger anisotropic scales, i.e. the residual anisotropy is assumed as a weak perturbation of an otherwise isotropic dynamics. This kind of reasoning fails when the anisotropic effects are strong as in the production range of shear dominated flows. This regime is analyzed here by means of both numerical and experimental data for a homogeneous shear flow. A well defined scaling behavior is found to exist, with exponents which differ substantially from those of classical isotropic turbulence. A systematic use of the SO(3) decomposition on the correlation tensors of velocity fluctuations enables to extract the different anisotropic contributions. They vanish at small scale at a relatively fast rate under weak shear. Under strong shear instead they keep a significant amplitude up to viscous scales, thus leaving a signature on the gradients.

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