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Dilute polymers in wall bounded flows: energy transfer i and spatial fluxes CARLO MASSIMO CASCIOLA, ELISABETTA DE ANGELIS, NICOLETTA MARATI, RENZO PIVA, Universita' di Roma "La Sapienza" — The single most significant aspect of Newtonian turbulence is the kinetic energy transfer through the scales. For dilute polymers solutions, kinetic energy is removed from certain scales to sustain the fluctuations in the micro-structure. In addition, applications are often characterized by a combination of shear and inhomogeneity, like e.g. for drag reduction in wall bounded flows. The large scale anisotropy is responsible for the production of turbulence while inhomogeneity generates spatial fluxes of energy. These complex interactions are addressed starting from a suitably generalized form of the classical Kolmogorov equation. A scale-by-scale budget for the turbulent fluctuations is evaluated to examine how the energy of a specific scale of motion is transferred through the spectrum of scales, how it is fed by the interaction with the large scale shear and exchanges energy with the spatial flux and with the polymers. The analysis is applied to data sets from direct numerical simulations (DNS) of a viscoelastic channel flow, and the results compared with those of homogeneous isotropic conditions. The detailed scale-by-scale balance is used to understand how - i.e. through which mechanisms, at which scales and in which regions of the flow domain - turbulent fluctuations are generated and sustained.

Carlo Massimo Casciola

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