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Turbulent intermittency as a consequence of stationarity of the energy balance

Sébastien Aumaitre[1] and Stéphan Fauve[2]
[1]DRF\IRAMIS\SPEC, CEA-Saclay, Gif-sur-Yvette, France (sebastien.aumaitre@cea.fr)
[2]Laboratoire de Physique de l'École Normale Supérieure, CNRS, PSL, Sorbonne Université, Paris, France (stephan.fauve@phys.ens.fr)

In his seminal work on turbulence, Kolmogorov made use of the stationary hypothesis to determine the Power Density Spectra of velocity field in turbulent flows. However to our knowledge, the constraints that stationary processes impose on the fluctuations of power have never been used in the context of turbulence. Here we recall that the Power Density Spectra of the fluctuations of the injected power, the dissipated power and the energy flux have to converge to a common value at vanishing frequency. Hence, we show that the intermittent GOY-shell model fulfills these constraints on the power as well as on the energy fluxes. We argue that they can be related to intermittency. Indeed, we find that the constraints on the power fluctuations imply a relation between scaling exponents, which is consistent with the GOY-shell model and in agreement with the She-Leveque formula. It also fixes the intermittent parameter of the log-normal model at a realistic value. The relevance of these results for real turbulence is drawn in the concluding remarks.