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Intermittency in turbulence generated by traditional fractal square grid and spaced fractal square grid

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The measurements of the longitudinal velocity were performed in an open-circuit suction wind tunnel installed at the laboratory of the Max-Planck Institute for Dynamics and Self-Organization in Gottingen, using hot wire anemometer at different positions in turbulent flow generated by a traditional fractal square grid (FSG) and by a spaced fractal square grid (SFSG) with similar physical properties have shown that the self-similarity is present. The statistical description of this complex turbulent system was performed using Extended Self Similarity (ESS). We propose a complementary methodology suitable for non-homogeneous turbulence based on the analysis of the energy transfer hierarchy. The signature of the non-homogeneous characteristics of a turbulent field, indicated by nonlocal dynamics, is separated from those usually assigned as being only due to the intermittency. We propose a physical interpretation of the observed scale independence of the relative scaling exponents in such non-homogeneous flows by means of the compensation effect of the energy transfer on the difference between the strong coherent turbulent events and the background less intense turbulence. This procedure is able to distinguish whether the intermittency arises from the small scales or is linked to coherent structures. The practical interest of this type of turbulent excitation concerns several fields of aeronautical and space application and energy or environmental problems of noise reduction of mixers in combustion or for the numerical models of prediction of the dispersion of pollutants in the atmosphere.