

TURBULENCE: MECHANICS AND STRUCTURE OF ANOMALOUS SCALINGS

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Anomalies in spectra and energetics of turbulence connected with structure of the source and also with spontaneous generation of internal scales parametrically different from the scale of force (the source) putting the fluid in motion are studied. First of all it is shown that for given parameters of external random force (amplitude, spatially-temporal correlational characteristics) large-scale turbulence possesses universal spectral properties. This theoretical result has got sufficiently reliable experimental confirmation. Further, new spectral peculiarities at those scales (generally speaking sufficiently small), where force source is quasiregular, is found. Finally, in agreement with directly displayed intermittent nature of small-scale turbulence, it is shown that the discrete set of states of stationary fully developed turbulence. Spectra and typical scales corresponding to these stationary states are found. The reasons for the fundamental property - discreteness of stationary states of turbulence are analyzed.