On the stochastic structure of isotropic turbulence

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The stochastic theory of isotropic turbulence has been greatly advanced after A.N. Kolmogorov's research on the spectral distribution of energy among turbulent eddies in an intermediate range of scales (at high Reynolds numbers). A satisfactory theory on the three dimensional energy spectrum for the entire range of scales has yet to be found. Here the stochastic structure of turbulence is studied and a unified model is presented and tested, using observational data, in terms of its spectrum, climacogram, and structural and autocorrelation functions. The data used for testing are nearly isotropic and homogeneous turbulent wind velocities downstream of an active grid and allow comparisons at a wide range of scales.