Abstract Submitted
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Emergence of multi-scaling in fluid turbulence[1] DIEGO DONZIS, Texas AM Univ, VICTOR YAKHOT, Boston University — We present new theoretical and numerical results on the transition to strong turbulence in an infinite fluid stirred by a Gaussian random force. The transition is defined as a first appearance of anomalous scaling of normalized moments of velocity derivatives (or dissipation rates) emerging from the low-Reynolds-number Gaussian background. It is shown that due to multi-scaling, strongly intermittent rare events can be quantitatively described in terms of an infinite number of different "Reynolds numbers" reflecting a multitude of anomalous scaling exponents. We found that anomalous scaling for high order moments emerges at very low Reynolds numbers implying that intense dissipative-range fluctuations are established at even lower Reynolds number than that required for an inertial range. Thus, our results suggest that information about inertial range dynamics can be obtained from dissipative scales even when the former does not exit. We discuss our further prediction that transition to fully anomalous turbulence disappears at $R_\lambda < 3$.

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Diego Donzis
Texas A
M Univ

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