A stochastic differential equation framework for the timewise dynamics of turbulent velocities

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Abstract

We discuss a stochastic differential equation, as a modelling framework for the timewise dynamics of turbulent velocities. The equation is capable of capturing basic stylized facts of the statistics of temporal velocity increments. In particular, we focus on the evolution of the probability density of velocity increments, characterized by a normal inverse Gaussian shape with heavy tails for small scales and approximately Gaussian tails for large scales. In addition, we show that the proposed model is in accordance with the experimental verification of Kolmogorov's refined similarity hypotheses.