A New Method for Estimating Intrinsic Reynolds Numbers
STEPHAN BARTH, ANNE LAUPICHLER, CHRISTOPH RENNER, JOACHIM PEINKE, University of Oldenburg - Institute of Physics — We present a method to estimate the Reynolds number of a turbulent flow without any knowledge of exact external boundary conditions. Considering the turbulent cascade as a Markovian process the evaluation of the transition probability density of velocity increments on different scales $\tau$ can be described by a Fokker-Planck equation which is completely defined by a drift and a diffusion coefficient. The scale dependence of these coefficients is given by simple polynomials, the parameters of which are a function of Reynolds number. In particular the slope of the constant part of the diffusion term, representing the Gaussian contribution to the general multiplicative noise is suitable to estimate the Reynolds number. This method has already been successfully applied to flows of freejets as well as cylinder and grid wake flows.