

Change of Time and Universal Laws in Turbulence

Ole E. Barndorff-Nielsen and Jürgen Schmiegel

Abstract

The notion of universality is a key concept in the phenomenological description of turbulent flows. Here, we report on empirical evidence for a new type of universality that goes beyond the universal scaling picture of fully developed turbulent states. We show that the empirical densities of turbulent velocity increments obtained from widely different experiments, covering a wide range of Reynolds numbers, collapse after applying a deterministic time change in terms of the variances of velocity increments. Moreover, the conditional distributions of velocity increments also collapse in terms of the intrinsic time change after adjusting the conditional means.