

Vortragsankündigung

Numerical investigations of scaling laws in rotating decaying turbulence

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Abstract

Rotation modulates turbulence causing columnar structuring of a turbulent flow. This yields significant changes in the flow characteristics and dispersion properties, which makes rotational turbulence modulation particularly relevant in the context of atmospheric and oceanic flows. Direct Numerical Simulations of canonical turbulence in a periodic box, subjected to rotation about a fixed vertical axis will be presented (spin-up of initially homogeneous isotropic turbulence). Details concerning numerical implementation of the pseudo-spectral code suited for solving incompressible Navier-Stokes equations with the Coriolis force in the rotating frame of reference will be given. The rotational flow structuring corresponds to (quasi) two-dimensionalization of the flow, similar to the Taylor-Proudman state. As a result, the decay rate of the kinetic energy is strongly reduced due to rotation. This effect is usually well characterized by a power law with increasing negative decay exponents for growing rotation rates. Such behaviour of the decay exponents is in agreement with results obtained for the experimentally investigated grid-generated turbulence in a rotating tank. Complementary numerical examination of the energy decay exponents will be presented. Alteration of intermittency measured in terms of changes in the scaling of the structure functions will be also discussed.

Zeit und Ort:

Freitag, 06. Februar 2009, 11:10 Uhr
Seminarraum ZEU 150a

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