Scalings of field correlations and heat transport in turbulent convection

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Résumé

Using direct numerical simulations of Rayleigh-Bénard convection (RBC) under free-slip boundary condition, we show that the normalized correlation function between the vertical velocity field and the temperature field, as well as the normalized viscous dissipation rate, scales as $Ra^{-0.22}$ for moderately large Rayleigh number Ra. This scaling accounts for the Nusselt number (Nu) exponent to be around 0.3 observed in experiments. Numerical simulations also reveal that the above normalized correlation functions are constants for the convection simulation under periodic boundary conditions.

Références

1. P. K. Mishra and M. K. Verma, 'Energy Spectra and fluxes for Rayleigh-Bénard convection', Phys. Rev. E **81**, 056316 (2010).

2. M. K. Verma, P. K. Mishra, A. Pandey and S. Paul, 'Scalings of field-correlations and heat transport in turbulent convection', accepted in Phys. Rev. E (Dec. 2011).