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Viscous boundary layers in turbulent Rayleigh-Bénard convection

LING LI, RONALD DU PUITS, ANDRÉ THESS, Ilmenau University of Technology — Thermal convection at high Rayleigh number is a basic and important ingredient for the motion of air or the flow of water in the atmosphere and in the ocean. However, particularly in case of highly turbulent flows the knowledge about the temperature and the velocity field is still limited. Highly resolved 3d-Laser Doppler Velocimetry measurements in a large-scale Rayleigh-Bénard experiment with air at Rayleigh numbers up to $10^{10}$ have been carried out and presented by our group on 2010’s APS conference. All three velocity components have been measured simultaneously in the vicinity of the cooling plate in the central axis of the cylindrical sample. We found that the profile of the mean wall-normal velocity tends to zero. In the contribution of this year we will enhance the understanding of the heat transport by presenting the fluctuations of the wall-normal velocity component and the temperature. Again, we estimate the profile of the local heat flux from the independently measured velocity and temperature data.

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