Scaling of the local convective heat flux in turbulent Rayleigh-Bénard convection PENGER TONG, Department of Physics, Hong Kong University of Science and Technology*, XIAO-DONG SHANG, South China Sea Institute of Oceanology, Chinese Academy of Sciences, KE-QING XIA, Department of Physics, the Chinese University of Hong Kong* — Local convective heat flux $J(r)$ in turbulent thermal convection is obtained from simultaneous velocity and temperature measurements in a cylindrical cell filled with water. The measured $J(r)$ at different locations in the convection cell is found to scale with the Rayleigh number Ra as $J(r) \sim Ra^{\beta}$. The scaling exponent β at the cell center far away from the cell boundaries is found to be $\beta \simeq 0.5$, in agreement with the Kraichnan scaling for the ultimate state of thermal convection. Near the sidewall and lower conducting plate, we find $\beta \simeq 0.24$. The experiment thus provides new insights into the mechanism of heat transport in turbulent convection.

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