

Abstract Submitted
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Experimental Measurement of the Local Energy Dissipation Rate and its Balance with the Local Heat Flux in Turbulent Thermal Convection¹ SHI-DI HUANG, RUI NI, KE-QING XIA, Department of Physics, The Chinese University of Hong Kong — The local energy dissipation rate $\epsilon_{u,c}$ in Rayleigh- Bénard convection cell was measured experimentally using the particle tracking velocimetry method, with varying Rayleigh number Ra , Prandtl number Pr , and system size H . It is found that $\epsilon_{u,c}/(\kappa^3 H^{-4}) = 1.05 \times 10^{-4} Ra^{1.55 \pm 0.02} Pr^{1.15 \pm 0.38}$. The Ra - and H -dependency of the measured result are found to be consistent with the assumption made for the bulk energy dissipation rate $\epsilon_{u,bulk}$ in the Grossmann-Lohse model, while the Pr -dependency is not. A remarkable finding of the study is that $\epsilon_{u,c}$ balances the directly measured local Nusselt number Nu_c in the cell center, not only scaling-wise but also in magnitude.

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