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**Thermal boundary layer profiles in turbulent Rayleigh-Benard convection** PENER TONG, YIN WANG, Department of Physics, Hong Kong University of Science and Technology*, XIAOZHOU HE, Max Planck Institute for Dynamics and Self Organization — We have studied the mean temperature boundary layer profile $T(z)$ and root-mean-square (rms) temperature profile $S(z)$ in turbulent Rayleigh-Benard convection along the central axis $z$ of a convection cell, which has a thin vertical disk shape with an inner diameter $D = 18$ cm. The temperature measurements were made at fixed Prandtl numbers $Pr = 4.3$ and $Pr = 7.6$ and with the Rayleigh number $Ra$ varied in the range between $1 \times 10^9$ and $1 \times 10^{10}$. The measured $T(z)$ for different values of $Pr$ and $Ra$ can all be well described by the newly proposed boundary layer model [Shishkina et al., Phys. Rev. Lett. 114, 114302 (2015)] with a parameter $c$ varying from 1 to 2.1. The measured rms temperature profile $S(z)$ is found to be a single-peaked function with the peak position located at $z \approx 0.8 \delta$, where $\delta$ is the boundary layer thickness. The measured $S(z)$ has two separate scaling lengths. Within the boundary layer, it scales with $\delta$ and can be fitted to a power law, $S(z) \sim (z/\delta)^\alpha$ with $\alpha \approx 0.6$. Outside the boundary layer, it scales with the cell size $D$ and follows a different power law, $S(z) \sim (z/D)^\beta$, with $\beta = -0.42$. *This work was supported by the Research Grants Council of Hong Kong SAR.

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