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Logarithmic temperature profiles in turbulent Rayleigh-Bénard convection[1] GUENTER AHLERS, UCSB, XIAOZHOU HE, MPIDS Goettingen Germany, DENIS FUNFSCHILLING, LSGC CNRS Nancy, France, DENNIS VAN GILS, EBERHARD BODENSCHATZ, MPIDS Goettingen Germany — We report experimental results for the vertical profiles of the mean temperature $\langle T \rangle$ and the rms temperature fluctuation σ for turbulent Rayleigh-Bénard convection in the interior of a cylindrical sample of aspect ratio $\Gamma \equiv D/L = 0.50$ ($D = 112$ cm and $L = 224$ cm are the diameter and height respectively) over the Rayleigh number range $4 \times 10^{12} \leq Ra \leq 10^{15}$ for a Prandtl number $Pr \simeq 0.8$. We found that $\langle T \rangle$ and σ vary linearly with $ln(z/L)$ where z is the distance from the bottom or top plate. Such a dependence had been predicted[2] for the ultimate state ($Ra > 5 \times 10^{14}$), but was unexpected for the classical state ($Ra < 10^{13}$). The results for $\langle T \rangle$ and σ suggest similarities to the logarithmic profiles found for the velocity in shear flows.[3,4]

[2]S. Grossmann and D. Lohse, Phys. Fluids **23**, 045108 (2011).
[3]I. Marusic *et al.*, Phys. Fluids **22**, 065103 (2010).
[4]M. Hultmark *et al.*, Phys. Rev. Lett **108**, 094501 (2012).

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