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Aspect-ratio dependence of small-scale temperature properties in turbulent Rayleigh-Bénard convection[1] PING WEI, School of Aerospace engineering and applied mechanics, Tongji U, Shanghai, GUENTER AHLERS, Department of Physics, UCSB, CA, USA — We report measurements of the variance σ^2, skewness S, and kurtosis K of temperature fluctuations in turbulent Rayleigh-Bénard convection of a fluid with Prandtl number $Pr = 12.3$ in cylindrical samples with aspect ratios $\Gamma = D/L$ (D is the diameter and L the height) of $0.50, 1.00$ and 2.00 in the Rayleigh-number range $6 \times 10^9 \leq Ra \leq 2 \times 10^{12}$. The measurements were primarily for the radial positions $\xi = 1.00$ (along the sample center line) and $\xi = 0.063$ (near the side wall) at several vertical locations z/L. For all Γ we found that σ^2 could be fitted by $\sigma^2 \sim (z/L)^{-\zeta}$ with $\zeta \simeq 0.7$ near the side wall and $\zeta \simeq 1.0$ along the sample center line ($\xi = 1.00$). At the sample center and for $\Gamma = 1$, the temperature probability distribution was very close to a Laplace distribution, with K close to 6 independent of Ra. However, for $\Gamma = 0.5$ the distribution was intermediate between Gaussian and Laplace, with K close to 4 and also independent of Ra. For $\Gamma = 2$ the distribution was close to Gaussian near the peak but had exponential tails, yielding K values that decreased from about 6 to about 4 as Ra increased.

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