Local temperature fluctuations in turbulent Rayleigh-Bénard convection with wide-ranging aspect ratios[1] KE-QING XIA, CHAO SUN, LI-YUAN REN, The Chinese University of Hong Kong — We report measurements of the local temperature fluctuations in 1-meter diameter cylindrical convection cells with aspect ratio Γ ranging from 0.67 to 20 and the Rayleigh number Ra varying from 10^7 to 4×10^{12}, at the Prandtl number Pr ≈ 4.3. Measurements are made at both cell center and the sidewall positions. The results show that the normalized temperature rms has a power-law dependence on Ra for all positions and aspect ratios, i.e. $\sigma/\Delta T \sim \mathrm{Ra}^{\alpha}$, where ΔT is the temperature difference across the convection cell. It is found that for sidewall positions α is approximately the same for most values of Γ, while it generally increases with Γ for the center positions. We also found that the magnitude of the normalized temperature rms at both the center and sidewall is approximately the same for large Γ ($\gtrsim 10$), while for small values of Γ the sidewall fluctuations are roughly a factor of 2 larger than the center ones.

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