Local temperature fluctuations in turbulent Rayleigh-Bénard convection with wide-ranging aspect ratios\textsuperscript{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 $\Gamma$ ranging from 0.67 to 20 and the Rayleigh number $Ra$ varying from $10^7$ to $4 \times 10^{12}$, at the Prandtl number $Pr \approx 4.3$. 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. $\sigma/\Delta T \sim Ra^\alpha$, where $\Delta T$ is the temperature difference across the convection cell. It is found that for sidewall positions $\alpha$ is approximately the same for most values of $\Gamma$, while it generally increases with $\Gamma$ 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 $\Gamma$ ($\gtrsim 10$), while for small values of $\Gamma$ the sidewall fluctuations are roughly a factor of 2 larger than the center ones.

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