

Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Temperature fluctuations in turbulent Rayleigh- Bénard convection for Ra up to 2×10^{14} and $Pr \simeq 0.8$ ¹ XIAOZHOU HE, DENNIS P.M. VAN GILS, EBERHARD BODENSCHATZ, MPI Dynamics and Self-Organization, Goettingen, Germany, GUENTER AHLERS, UCSB, Santa Barbara, USA — We report on measurements of temperature space-time cross-correlation functions $C_T(r, \tau)$ in Rayleigh-Bénard convection (RBC) near the side wall of a cylindrical sample with aspect ratio $\Gamma \equiv D/L = 1.00$ ($D = 1.12$ m was the diameter and $L = 1.12$ m was the height). The results covered the Rayleigh-number range $4 \times 10^{11} \leq Ra \leq 2 \times 10^{14}$ and the Prandtl-number range $0.79 \leq Pr \leq 0.86$. Our results extend previous measurements for a lower Ra range² and confirmed the elliptic approximation (EA) of He and Zhang³ up to $Ra \simeq 10^{14}$. Using the EA, we determined an effective Reynolds number near the transition to the ultimate state of turbulent RBC.⁴

¹Supported by the Max Planck Society, the Volkswagen Stiftung, the DFD Sonderforschungsbereich SFB963, and NSF grant DMR11-58514.

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Xiaozhou He
MPI Dynamics and Self-Organization, Goettingen

Date submitted: 25 Jul 2012

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