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Torsional oscillation of the large-scale circulation in turbulent Rayleigh-Bénard convection at large Rayleigh numbers[1] DENNIS P.M. VAN GILS, XIAOZHOU HE, MPI-DS, Göttingen, Germany, GUENTER AHLERS, UCSB, Santa Barbara, USA, EBERHARD BODENSCHATZ, MPI-DS, Göttingen, Germany — We present temperature measurements in turbulent Rayleigh–Bénard convection (RBC) over the Rayleigh number range $3.0 \times 10^{13} \leq Ra \leq 1.3 \times 10^{14}$ and at constant Prandtl number $\mathrm{Pr} \approx 0.8$. The RBC sample, known as the High-Pressure Convection Facility (HPCF) of Göttingen [1], is an upright cylinder of aspect ratio $\Gamma = 1.00$. Using three horizontal rows of thermistors at different heights in the sample, we determined the orientation angle of the large-scale circulation (LSC) plane, similar to [2]. Results identify a well established single-roll LSC with a periodic "torsional" mode with a frequency f_C. The values of f_C are consistent with the frequencies f_L obtained from power spectra $P(f)$ of temperature time series taken at mid-height of the sample. The non-dimensionalized frequencies $\tilde{f}_C$ are well described by a power law: $\tilde{f}_C \propto Ra^{\zeta_f}$ with $\zeta_f = 0.427 \pm 0.001$.

[1] He, Funfschilling, Bodenschatz and Ahlers, New J. Phys. **14**, 063030 (2012).
[2] Weiss and Ahlers, J. Fluid Mech. **688**, 461 (2011).

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