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The Reynolds number of the large-scale circulation in turbulent Rayleigh-Benard convection[1] DENIS FUNFSCHILLING, ERIC BROWN, ALEXEI NIKOLAENKO, GUENTER AHLERS, University of California, Santa Barbara — We measured Reynolds numbers R_e of the large-scale circulation of turbulent Rayleigh-Bénard convection over the Rayleigh-number range $2 \times 10^8 \lesssim R \lesssim 10^{11}$ and Prandtl-number range $3.3 \lesssim \sigma \lesssim 29$ for cylindrical samples of aspect ratio $\Gamma = 1$. For $R \lesssim R_c \simeq 3times10^9$ we found $R_e \sim R^{\beta_{eff}}$ with $beta_{eff} \simeq 0.46 < 1/2$. Here both the σ- and R- dependences are quantitatively consistent with the Grossmann- Lohse (GL) prediction. For $R > R_c$ we found $R_e = 0.106\ sigma^{-3/4}R^{1/2}$, which differs from the GL prediction. The relatively sharp transition at R_c to the large-R regime suggests a qualitative and sudden change that renders the GL prediction inapplicable.

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