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Direct numerical simulation of confined turbulent thermal convection at high Rayleigh numbers ROBERTO VERZICCO, Politecnico di Bari, KATEPALLI SREENIVASAN, International Centre for Theoretical Physics — Results from direct numerical simulations of turbulent Boussinesq convection are presented. The flow is computed for a cylindrical cell of aspect ratio 1/2 in order to compare with the results from recent experiments. The results span eight decades of the Rayleigh number, *Ra*, from 2×10^6 to 2×10^{14}, and are unique because the Prandtl number is held constant at 0.7 and Boussinesq conditions are strictly enforced. One of the conclusions is that the Nusselt number varies nearly as the 1/3 power of *Ra* for about 4 decades towards the upper end of the *Ra*-range covered. Another important observation is that, in same range of *Ra*, the large-scale recirculation, often called the mean wind, first weakens and eventually disappears. In the absence of the mean wind, the thermal boundary layers on the lower and upper plates become disconnected from each other, and the heat transfer scaling becomes essentially independent of the plate distance h. This is one of the basic assumptions of Malkus (1954) leading to the 1/3 power law of the relation between the Nusselt and Rayleigh numbers.

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