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Scaling laws in turbulent Rayleigh-Benard convection with different geometry HAO SONG, PENGER TONG, Hong Kong University of Science and Technology — The discovery of scaling laws in the heat flux, large-scale circulation and temperature statistics in turbulent convection has stimulated considerable experimental and theoretical efforts, aimed at understanding the universal nature of the observed scaling laws. Because of historical reasons, most of the experimental results were obtained in upright cylindrical cells with small aspect ratios. An important question one might ask is: To what extend are these scaling laws universal in that they are independent of the cell geometry? Understanding of this question has important implications to large-scale astro/geophysical convection, such as that in the atmosphere and oceans, in which boundary effects are less important. In this talk, we report an experimental study of turbulent convection in a horizontal cylinder with the bottom 1/3 (curved) surface heated and the top 1/3 surface cooled. The experiment is carried out with varying aspect ratios and Rayleigh numbers. It is found that the measured Nusselt number and Reynolds number obey the same scaling laws as those obtained in the upright cylinder. The local temperature statistics, on the other hand, change with the aspect ratio of the cell and are different from the earlier results. The experiment reveals important geometric effects of the scaling laws in turbulent convection. *Work supported by the Research Grants Council of Hong Kong SAR.

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