Abstract Submitted
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Dynamics of the large-scale circulation of turbulent Rayleigh Benard convection in cubic containers[1] ERIC BROWN, DANDAN JI, KUNLUN BAI, Yale University — We report experimental results on the dynamics of the large-scale circulation (LSC) of turbulent Rayleigh-Benard convection in cubic containers. A new oscillation in the shape of the temperature profile of the LSC is found in cubic (but not cylindrical) cells. This can be explained by assuming the heat transported by the LSC is proportional to the pathlength of the LSC along the thermal boundary layers at the top and bottom plates. In a non-cylindrical cell, the pathlength oscillates as the LSC oscillates around a corner. We also test the forcing on the LSC orientation θ_0 in a cell tilted relative to gravity. Using a low-dimensional model of diffusion of θ_0 in a potential, the probability distribution of θ_0 is used to obtain a potential acting on θ_0. This potential is used to successfully predict changes in the barrier-crossing rate for θ_0 to escape different corners of the cell. The shape of the tilt-induced potential is due to the vector direction of the buoyancy force acting on the LSC. However, the magnitude of this forcing is found to be two orders of magnitude larger than previously predicted.

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