

Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Superstructures in turbulent thermal convection in slender cells¹

OLGA SHISHKINA, LUKAS ZWIRNER, Max Planck Institute for Dynamics and Self-Organization, Goettingen — The large scale circulation (LSC) is one of the most important features in turbulent natural thermal convection. It is self-organized, has its own complicated dynamics and plays a key role in the global heat and momentum transport in convective systems. In this study, we analyze the LSC properties in turbulent Rayleigh–Benard convection and inclined convection of small-Prandtl-number fluids in slender geometries (cylindrical containers of the diameter-to-height aspect ratios smaller than one). We investigate in detail the structures of the so-called single-roll and multiple-roll LSCs, their strength and path lengths and their relation to the strength of the volume-averaged heat transport in the system. The problems of the LSC extraction in experiments and numerical simulations and interpretation of the different LSC modes will be also discussed.

¹This work is supported by the Deutsche Forschungsgemeinschaft (DFG) under the grants Sh405/7 (SPP 1881 “Turbulent superstructures”) and Sh405/4 (Heisenberg fellowship). We acknowledge the Leibniz Supercomputing Centre (LRZ) for providing computing resources.

Olga Shishkina
Max Planck Institute for Dynamics and Self-Organization, Goettingen

Date submitted: 31 Jul 2019

Electronic form version 1.4