Superstructures in turbulent thermal convection in slender cells[1]

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.

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

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