DY 32: Invited Talk Stephan Weiss

Time: Wednesday 15:00–15:30 Location: H19

Invited Talk DY 32.1 Wed 15:00 H19

Large scale patterns in turbulent Rayleigh-Bénard convection

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Thermal convection is one of the most important heat transport mechanisms and the driving force behind large scale flows in geo- and astrophysics. It is mostly studied in the Rayleigh-Bénard (RB) setup, where a horizontal fluid layer is heated from below and cooled from above. RB convection is a model system not only to study transport phenomena in turbulent flows under strong driving, but also to study pattern formation as it exhibits regular laminar flow patterns under weak thermal driving. Turbulent RB convection is usually studied experimentally and numerically in containers of small aspect ratios between their lateral size (L) and their height (H). Rather recently, however, investigations have also focused on RB convection in laterally extended systems, as it was found that the time-averaged mean velocity resembles the laminar pattern under weak driving. In my talk I will first discuss some recent developments in the research of large scale patterns in RB convection. Then I will present our own results from volumetric spatially velocity measurements in a rectangular RB cell with a square horizontal cross-section and an aspect ratio $\Gamma = L/H = 16$. Via Lagrangian particle tracking, we have measured the velocity and acceleration of up to 300,000 fluorescent microspheres simultaneously and have calculated the entire three-dimensional velocity field with a resolution of about the Kolmogorov length. From these data, we can determine the large scale patterns, as well as their morphology and follow their slow temporal evolution.