Abstract Submitted for the DFD12 Meeting of The American Physical Society

Flow structure in turbulent rotating Rayleigh–Bénard convection RUDIE KUNNEN, YOANN CORRE¹, HERMAN CLERCX, Eindhoven University of Technology — Turbulent Rayleigh-Bénard convection is usually studied in an upright cylinder. The addition of axial rotation has profound effects on the flow structuring. The well-known large-scale circulation (LSC) of the non-rotating case is still found at low rotation rates but is replaced by an irregular array of vertically aligned vortical plumes at higher rotation rates. We report PIV measurements of turbulent rotating convection in a cylindrical cell of diameter-to-height aspect ratio $\Gamma = 1/2$ at Rayleigh number $Ra = 4.5 \times 10^9$ and at many rotation rates covering both the LSC and the vortical-plume regime. We focus on: (i) the azimuthal precession of the LSC, (ii) collective motions of the vortical plumes, and (iii) the sidewall boundary layers. With these results we can clarify remarkable differences between the $\Gamma = 1$ and $\Gamma = 1/2$ cases reported recently in the literature.

¹Traineeship project carried out in Eindhoven as part of Master's Degree at Université Paris–Sud, France.

> Rudie Kunnen Eindhoven University of Technology

Date submitted: 04 Jul 2012

Electronic form version 1.4