Abstract Submitted
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Rotating Rayleigh-Benard convection in a cylindrical cell with aspect ratio two JIM V. OVERKAMP, Eindhoven University of Technology, RICHARD J.A.M. STEVENS, DETLEF LOHSE, University Twente, HERMAN J.H. CLERCX, Eindhoven University of Technology — Turbulent thermal convection occurs for example in the Earth's atmosphere and in the Earth's liquid outer core, which can be represented by the rotating Rayleigh-Bénard problem. We investigate the effect of rotation on heat transport and the presence of the large-scale circulation (LSC) in a cylindrical cell with aspect ratio $\Gamma = 2$. The Rayleigh number Ra in these experiments is varied between 2×10^8 and 1.5×10^9, with Prandtl number $Pr \approx 4.4$. Non-rotating measurements of heat transport agree with literature data (both for cells with $\Gamma = 1$ and 2). Heat transport in rotating Rayleigh-Bénard convection (rotation vector parallel with the cylinder axis) is increased by up to 20% ($Ra = 3 \times 10^8$), which is larger than reported heat transfer enhancements for $\Gamma = 1$ cells (and similar Ra). The onset of this enhancement by rotation is located at a higher Rossby value than for the cell with $\Gamma = 1$. This is likely caused by the weaker, elliptical LSC, allowing Ekman pumping to take over heat transport more easily. The disappearance of the LSC around $Ro = 7$ is also indirectly confirmed by temperature measurements along the sidewall of the convection cell.

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