Abstract Submitted
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Inclined turbulent thermal convection in liquid sodium[1] LUKAS ZWIRNER, Max Planck Institute for Dynamics and Self-Organization, RUSLAN KHALILOV, ILYA KOLESNICHENKO, ANDREY MAMYKIN, SERGEY MANDRYKIN, ALEXANDER PAVLINOV, ALEXANDER SHESTAKOV, ANDREY TEIMURAZOV, PETER FRICK, Institute of Continuous Media Mechanics, OLGA SHISHKINA, Max Planck Institute for Dynamics and Self-Organization — Inclined turbulent thermal convection at large Rayleigh numbers (Ra) in extremely small Prandtl-number (Pr) fluids is studied by measurements and high-resolution numerical simulations. The working fluid is liquid sodium (Pr about 0.0094) and the considered Ra is around 1.5×10^7. The convection cell is a cylinder with equal height and diameter, where one circular surface is heated and another one cooled. For the limiting inclination angle β, which correspond to Rayleigh-Benard convection ($\beta = 0$) and vertical convection ($\beta = \pi/2$), the scaling relations of the mean heat flux (Nusselt number Nu) with Ra are studied. Any inclination of the RBC cell leads to an increase of Nu; the maximal Nu is obtained, however, for a certain intermediate value of β. For small β, the large-scale circulation (LSC) exhibits a complex dynamics, with torsion and sloshing modes, which are suppressed for large β. When the LSC is twisted, the volume-average vertical heat flux is minimal, and it is maximal, when the LSC sloshing brings together the hot and cold streams of the LSC.

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