

Abstract Submitted
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A cryostat device for liquid nitrogen convection experiments¹

CHARLES DUBOIS, ALEXIS DUCHESNE, HERVE CAPS, GRASP - University of Liege — When a horizontal layer of expansible fluid heated from below is submitted to a large vertical temperature gradient, one can observe convective cells. This phenomenon is the so-called Rayleigh-Bénard instability. In the literature, this instability is mainly studied when the entire bottom surface of a container heats the liquid. Under these conditions, the development of regularly spaced convective cells in the liquid bulk is observed. Cooling applications led us to consider this instability in a different geometry, namely a resistor immersed in a bath of cold liquid. We present here experiments conducted with liquid nitrogen. For this purpose, we developed a cryostat in order to be able to perform Particle Image Velocimetry. We obtained 2D maps of the flow and observed, as expected, two Rayleigh-Bénard convective cells around the heater. We particularly investigated the vertical velocity in the central column between the two cells. We compared these data to results we obtained with silicone oil and water in the same geometry. We derived theoretical law from classical models applied to the proposed geometry and found a good agreement with our experimental data.

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