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Natural convection inside a cylindrical container with a free upper surface GUILLERMO RAMÍREZ-ZÚÑIGA, GUILLERMO N. HERNÁDEZ, GUILLERMO HERNÁNDEZ-CRUZ, JOSÉ NÚÑEZ, EDUARDO RAMOS, Center for Energy Research - UNAM — This work reports experimental observations and numerical calculations of the natural convective flow inside a cylindrical container (height/diameter= 1.25) with a free upper surface. The bottom and top walls are at high and low temperatures respectively. The Rayleigh number range explored is $10^5 < Ra < 5 \times 10^6$ which includes steady-state and time dependent flows. The working fluid considered is water (Pr=6.67). The observations were made with a stereoscopic PIV system that rotates around the container. With this device, the three component velocity field in the whole volume of the container can be recorded and full three dimensional flow patterns can be reconstructed. The numerical calculation was made with a hybrid finite volume-spectral method considering a free stress boundary for the upper surface. Flow patterns and stability properties are described in the context of potential applications to crystal growth technology.

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