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A comparative experimental and numerical study of rotating Rayleigh-Bénard convection in a cylindrical cell GERARDO PAOLILLO, CARLO SALVATORE GRECO, Univ of Naples Federico II, RICHARD STEVENS, Univ of Twente, TOMMASO ASTARITA, Univ of Naples Federico II, ROBERTO VERZICCO, Univ of Rome Tor Vergata, Univ of Twente, GENNARO CARDONE, Univ of Naples Federico II — Rotating Rayleigh-Bénard convection (RBC) is the buoyancy-driven flow resulting from temperature gradients parallel to the gravity in the presence of rotation. In this work we comparatively present the results from an experimental and numerical investigation of RBC in a cylindrical cell with aspect ratio of 1/2 in non-rotating conditions and at different Rossby numbers. On the experimental side, time-resolved tomo-PTV is used to perform whole-field velocity measurements in a cell immersed in a water tank with constant controlled bulk temperature. This setup is accurately modeled in the direct numerical simulations by including the presence of the sidewall in the computational domain and solving the temperature field in both the fluid and solid regions. Excellent agreement between experiments and DNS is found for the non-rotating convection, whereas some discrepancies are observed when rotation is added. The latter might be related to the specific motions in the water tank at the outside of the experimental cell.

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