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Transitions in turbulent rotating convection HADI RAJAEI, KIM ALARDS, RUDIE KUNNEN, FEDERICO TOSCHI, HERMAN CLERCX, Eindhoven University of Technology, FLUID DYNAMICS LAB TEAM — This study aims to explore the flow transition from one state to the other in rotating Rayleigh-Bènard convection using Lagrangian acceleration statistics. 3D particle tracking velocimetry (3D-PTV) is employed in a water-filled cylindrical tank of equal height and diameter. The measurements are performed at the center and close to the top plate at a Rayleigh number Ra = 1.28e9 and Prandtl number Pr = 6.7 for different rotation rates. In parallel, direct numerical simulation (DNS) has been performed to provide detailed information on the boundary layers. We report the acceleration pdfs for different rotation rates and show how the transition from weakly to strongly rotating Rayleigh-Bènard affects the acceleration pdfs in the bulk and boundary layers. We observe that the shapes of the acceleration PDFs as well as the isotropy in the cell center are largely unaffected while crossing the transition point. However, acceleration pdfs at the top show a clear change at the transition point. Using acceleration pdfs and DNS data, we show that the transition between turbulent states is actually a boundary layer transition between Prandtl-Blasius type (typical of non-rotating convection) and Ekman type.

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