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Velocity and acceleration statistics in rotating Rayleigh-Bénard convection: Indicators for transition. HADI RAJAEI, KIM ALARDS, RUDIE KUNNEN, HERMAN CLERCX, Eindhoven Univ of Tech — Background rotation causes different flow structures and heat transfer (HT) efficiencies in Rayleigh-Bénard convection. Three main regimes are known: rotation-unaffected (regime I), rotation-affected (regime II) and rotation-dominated (regime III). Regimes I and II are easily accessible with experiments and simulations, thus they have been extensively studied. Regime III and the transition to this regime are less explored. There are two main hypotheses proposed for the driving mechanisms of the transition to regime III: (i) the relative thicknesses of the viscous and thermal boundary layers (BLs) and (ii) vortical plumes which span throughout the entire domain. These hypotheses are usually examined through different parameters such as viscous and thermal BLs thicknesses and HT efficiency. In this work, we study regime III and these hypotheses from a new perspective: Lagrangian velocity/acceleration fluctuations and autocorrelations of tracers from experiments. We have found that the transition to regime III coincides with three phenomena; suppressed vertical motions, strong penetration of vortical plumes into the bulk and reduced interaction of vortical plumes with their surroundings. These findings allow us to evaluate the available hypotheses and learn more about regime III.

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