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Effect of thermally inertial particles on heat transport in Rayleigh–Bénard convection KIM ALARDS, RUDIE KUNNEN, FEDERICO TOSCHI, HERMAN CLERCX, Eindhoven University of Technology — We track particles that experience both mechanical and thermal inertia in direct numerical simulations of Rayleigh–Bénard convection (RBC), a fluid layer heated from below and cooled from above. Both particles and fluid exhibit thermal expansion. The particles have a larger thermal expansion coefficient than the fluid, such that particles become lighter than the fluid near the hot bottom plate and heavier than the fluid near the cold top plate. First we investigate how the dynamics of thermal expansion affect the distribution of particles in the RBC cell. We find a regime of viscous and thermal response times where the concentration of particles at the plates is enhanced. A particle deposited on a plate re-suspends after a characteristic residence time, that depends on the thermal response time. Now that we found a mechanism driving particles towards the plates, while also enforcing a motion back to the bulk, we include mechanical and thermal two-way coupling and investigate how thermally responsive particles affect flow structures and heat transfer in RBC. Ultimately, we want to explore the possibility to enhance heat transfer using these thermally inertial particles.

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