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Boundary layers in turbulent convection for air, liquid gallium and liquid sodium JANET SCHEEL, Occidental College, JOERG SCHUMACHER, TU Ilmenau — The scaling of physical quantities that characterize the shape and dynamics of the viscous and thermal boundary layers with respect to the Rayleigh number will be presented for three series of three-dimensional high-resolution direct numerical simulations of Rayleigh-Benard convection (RBC) in a closed cylindrical cell of aspect ratio one. The simulations have been conducted for convection in air at a Prandtl number $\mathrm{Pr} = 0.7$, in liquid gallium at $\mathrm{Pr} = 0.021$ and in liquid sodium at $\mathrm{Pr} = 0.005$. Then we discuss three statistical analysis methods which have been developed to predict the transition of turbulent RBC into the ultimate regime. The methods are based on the large-scale properties of the velocity profile. All three methods indicate that the range of critical Rayleigh numbers is shifted to smaller magnitudes as the Prandtl number becomes smaller. This work is supported by the Priority Programme SPP 1881 of the Deutsche Forschungsgemeinschaft.

Janet Scheel
Occidental College

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