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Local boundary layer scales in turbulent Rayleigh-Benard convection[1] JANET SCHEEL, Occidental College, JOERG SCHUMACHER, Technische Universitaet Ilmenau — A method is presented for computing fully local boundary layer scales for the velocity and temperature fields obtained from simulations of three-dimensional turbulent Rayleigh-Benard convection. These local boundary layer scales reflect the strong spatial inhomogeneities of both boundary layers due to the large-scale, but complex and intermittent, circulation that builds up in closed convection cells. The statistics of the local boundary layer scales are discussed as well as the scaling of mean boundary layer thicknesses, the resulting shear Reynolds number and the friction coefficient with respect to Rayleigh number. Additionally, an analysis of the recently suggested dissipation layer thickness scales versus Rayleigh number is conducted. All investigations are based on highly accurate spectral element simulations which reproduce gradients and their fluctuations reliably. The study is done for a Prandtl number of 0.7 and for Rayleigh numbers which extend over nearly five orders of magnitude, $3 \times 10^5 \leq Ra \leq 10^{10}$ in cells of aspect ratio of one. One study of aspect ratio equal to three is also performed in the case of $Ra = 10^8$.

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