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Resolving the fine-scale structure in turbulent Rayleigh-Benard convection JANET SCHEEL, Occidental College, Los Angeles, MOHAMMAD EMRAN, JOERG SCHUMACHER, Ilmenau University of Technology, Ilmenau, Germany — Results from high-resolution direct numerical simulations of turbulent Rayleigh-Benard convection in a cylindrical cell with an aspect ratio of one will be presented. We focus on the finest scales of convective turbulence, in particular the statistics of the kinetic energy and thermal dissipation rates in the bulk and the whole cell. These dissipation rates as well as the local dissipation scales are compared for different Rayleigh and Prandtl numbers. We also have investigated the convergence properties of our spectral element method and have found that both dissipation fields are very sensitive to insufficient resolution. We also demonstrate that global transport properties, such as the Nusselt number and the energy balances, are partly insensitive to insufficient resolution and yield consistent results even when the dissipation fields are under-resolved. Our present numerical framework is also compared with high-resolution simulations which use a finite difference method. For most of the compared quantities the agreement is found to be satisfactory.

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