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Turbulent Superstructures in Rayleigh-Bénard convection at different Prandtl number JÖRG SCHUMACHER, AMBRISH PANDEY, TU Ilmenau, MARTIN ENDER, RÜDIGER WESTERMANN, TU München, JANET D. SCHEEL, Occidental College Los Angesles — Large-scale patterns of the temperature and velocity field in horizontally extended cells can be considered as turbulent superstructures in Rayleigh-Bénard convection (RBC). These structures are obtained once the turbulent fluctuations are removed by a finite-time average. Their existence has been reported for example in Bailon-Cuba et al. (J. Fluid Mech., vol. 655, 152-173 (2010)). This large-scale order obeys a strong similarity with the well-studied patterns from the weakly nonlinear regime at lower Rayleigh number in RBC. In the present work we analyze the superstructures of RBC at different Prandtl number for Prandtl values between $Pr = 0.005$ for liquid sodium and 7 for water. The characteristic evolution time scales, the typical spatial extension of the rolls and the properties of the defects of the resulting superstructure patterns are analyzed. Data are obtained from well-resolved spectral element direct numerical simulations. The work is supported by the Priority Programme SPP 1881 of the Deutsche Forschungsgemeinschaft.

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