Abstract Submitted
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Nematic - isotropic phase transition in turbulent thermal convection[1] GUENTER AHLERS, STEPHAN WEISS, Department of Physics, University of California, Santa Barbara, USA — The nematic-isotropic transition of a liquid crystal (LC) at a temperature T_{NI} is an example of a *soft* phase transition, where fluid properties, although discontinuous, change only very little and where the latent heat is small. Understanding thermal convection in the presence of such a phase change is relevant to convection in Earth's mantle where discontinuous changes of the crystalline structure occur. We report on turbulent Rayleigh-Bénard convection of a nematic LC while it undergoes a transition from the nematic to the isotropic phase in a cylindrical convection cell with aspect ratio Γ (height over diameter) of 0.50. The difference between the top- and the bottom-plate temperature $\Delta T = T_b - T_t$ was held constant, while the average temperature $T_m = (T_b + T_t)/2$ was varied. There was a significant increase of heat transport when T_{NI} was between T_b and T_t. Measurements of the temperatures along the side wall as a function of T_m showed several ranges with qualitatively different behavior of quantities such as the time-averaged side-wall temperature, temperature gradient, or temperature fluctuations. We interpret these different ranges in terms of processes in the thermal boundary layers close to the top and bottom plates.

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