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Energy spectra for turbulent Rayleigh-Bénard convection MICHAEL KWAN, JANET SCHEEL, Occidental College — We investigated the scaling behaviors for numerically simulated, turbulent Rayleigh-Bénard convection by determining the kinetic and thermal energy spectra. The systems have aspect ratio 1, Prandtl numbers 0.7, 0.021 and 0.005, and various Rayleigh numbers ranging from 10^5 to 10^{10}. Whereas in previous studies the frequency spectra from a time series were considered, we calculated the energy spectra from spatial fields. In particular, we performed Fourier analysis on two-dimensional cross sections of the temperature and velocity fields. We also computed the conditional velocity and temperature structure functions on the same cross sections to verify our findings. Lastly, we tested whether Kolmogorov's 1941 (K41) scaling law or the Bolgiano-Obukhov (BO) scaling law applied to both the kinetic and thermal energy spectra for the various systems.

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