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Scaling laws prediction from a solvable model of turbulent thermal convection

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A solvable turbulent model is used to predict both the structure of the boundary layer and the scaling laws in thermal convection. The transport of heat depends on the interplay between the thermal, viscous and integral scales of turbulence, and thus, on both the Prandtl number and the Reynolds numbers. Depending on their values, a wide variety of possible regimes is found, including the classical $2/7$ and $1/3$ law, and a new $4/13=0.308$ law for the Nusselt power law variation with the Rayleigh number.

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