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Bounds on vertical heat transport for infinite Prandtl number Rayleigh-Bénard convection CHARLES R. DOERING[1], University of Michigan, FELIX OTTO[2], University of Bonn, MARIA G. REZNIKOFF[3], University of Bonn and Princeton University — For the infinite Pandtl number limit of the Boussineq equations, the enhancement of vertical heat transport in Rayleigh-Bénard convection, the Nusselt number Nu, is bounded above in terms of the Rayleigh number Ra according to $Nu \leq .644 \times Ra^{1/3}[\log Ra]^{1/3}$ as $Ra \to \infty$. This rigorous estimate follows from the utilization of a novel logarithmic profile in the background method for producing bounds on bulk transport together with new estimates for the bi-Laplacian in a weighted L^2 space. It is a quantitative improvement over the best currently available analytic result, and it comes within the mild logarithmic factor of the pure 1/3 scaling anticipated by both the classical marginally stable boundary layer argument and the most recent high-resolution numerical computations of the optimal bound on Nu using the background method.

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