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New upper bounds for convection in a fluid-saturated porous layer[1] BAOLE WEN, GREG CHINI, University of New Hampshire, CHARLES DOERING, University of Michigan — There has been renewed interest in buoyancy-driven convection in porous media owing in part to applications relating to carbon dioxide sequestration in terrestrial aquifers. As in other convection problems, a key quantity of interest is the normalized volume and time averaged heat flux through the layer, i.e. the Nusselt number (Nu). Here, we present an improved upper bound on Nu as a function of Rayleigh number (Ra) for a model of thermally driven porous medium convection. The bound is obtained by numerically solving the full "background field" variational problem first posed by Doering and Constantin (1998) for this model. We describe an efficient numerical algorithm for solving the variational problem and present improved bounds indicating that Nu $\sim$ c Ra (for computed constant c).

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