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Bounds on double diffusive convection ATICHART KETTAPUN, University of California at Santa Cruz, NEIL BALMFORTH, SHILPA GHADGE, SHREYAS MANDRE, University of British Columbia — We consider double-diffusive convection between two parallel plates and compute bounds on the flux of the unstably stratified species using the background method. The bound on the heat flux for Rayleigh-Bénard convection also serves as a bound on the double-diffusive problem (with the thermal Rayleigh number equal to that of the unstably stratified component). In order to incorporate a dependence of the bound on the stably stratified component, an additional mixed energy constraint has to be included, like the one used by Joseph (1976) to improve the energy stability of this system. Our bound extends Joseph's result beyond his energy stability boundary. Exactly on the energy stability boundary, we find a jump in the bound suggestive of the appearance of new finite-amplitude solutions in a saddle-node bifurcation, although the result is obscured by further discontinuity introduced because we use piece-wise linear optimizing profiles for the diffusing fields. At large Rayleigh number, the bound is found to behave like $R_T^{1/2}$ for fixed ratio R_S/R_T, where R_T and R_S are the Rayleigh numbers of the unstably and stably stratified components, respectively.

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