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Effects of Density Stratification in Compressible Polytropic Convection CATHRYN M. MANDUCA, EVAN H. ANDERS, BAYLEE BORDWELL, BENJAMIN P. BROWN, Dept. Astrophysical Planetary Sciences, University of Colorado – Boulder, Boulder, CO 80309, USA, KEATON J. BURNS, Dept. Physics, Massachusetts Institute of Technology, Cambridge, MA 02139, USA, DANIEL LECOANET, Princeton Center for Theoretical Science, Princeton University, Princeton, NJ 08544, USA, JEFFREY S. OISHI, Dept. Physics Astronomy, Bates College, Lewiston, ME 04240, USA, GEOFFREY M. VASIL, School of Mathematics Statistics, University of Sydney, NSW 2006, Australia — We study compressible convection in polytropically-stratified atmospheres, exploring the effect of varying the total density stratification. Using the Dedalus pseudospectral framework, we perform 2D and 3D simulations. In these experiments we vary the number of density scale heights, studying atmospheres with little stratification (1 density scale height) and significant stratification (5 density scale heights). We vary the level of convective driving (quantified by the Rayleigh number), and study flows at similar Mach numbers by fixing the initial superadiabaticity. We explore the differences between 2D and 3D simulations, and in particular study the equilibration between different reservoirs of energy (kinetic, potential and internal) in the evolved states.

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