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INVESTIGATING THERMODYNAMICS OF VERTICAL ATMOSPHERIC ENERGY TRANSPORT

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ABSTRACT

Thermodynamics of vertical atmospheric energy transport are investigated by using simple one-dimensional vertical energy balance models (i.e., radiative-equilibrium or radiative-convective models) coupled with the expressions shown the best performance in calculating the Earth's radiation entropy fluxes. The vertical profiles of net atmospheric entropy flux under different atmospheric conditions (with different atmospheric LW optical depths) are investigated, separately for the two kinds of energy balance models. The differences of the vertical profiles of net atmospheric entropy flux between the two kinds of energy balance models are analyzed. The significances of atmospheric convective processes (i.e., one of the key processes for vertical atmospheric energy transport) on shaping the Earth's climate and on enhancing the overall entropy production of the Earth's climate system are discussed. Potential thermodynamic constraint(s) for the Earth's climate system are also explored from these simple models.
