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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the role of thermal expansion and compression in large scale atmospheric energy and mass transports" *by* Melville E. Nicholls and Roger A. Pielke Sr.

Anonymous Referee #1

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The authors used idealized simulations to illustrate the importance of thermal compression waves in the total energy transport at the speed of sound (in those simulations). This part is convincing.

The authors also used these results to question the traditional view of energy transport by transient eddy, stationary eddy, and mean meridional circulations. However, their argument is not convincing.

If their claim can be quantified (see the suggestion below), it would represent an important contribution.

Major comments:

Conceptually, eddies in traditional view include waves (e.g., gravity and Rossby waves). Therefore the authors' claim (that the traditional view considers the total energy transfer solely in an advective-like manner by the winds) seems incorrect.

Quantitatively, the authors should show the corresponding results based on the traditional view (i.e., using equations 1-3) in the figures and actually demonstrate the differences of these results versus their results. This would help address the relative importance of thermal compression waves.

The presentation is clear. However, for the key points in the manuscript, the use of 28 figures is not justified. The authors could make good use of supplementary material by moving most of the figures there. This would also increase the readability.

Minor comments:

Equation 2: there should be square brackets on the right hand side, to be consistent with equation 3.

Figures 1 and 2: when u' is as large as 5-10 m/s, should a nonlinear model (rather than a linearized model) be used? How does it affect the results?

Figure 9: is the exponent (-5) in "kg mˆ-3 10ˆ-5" correct in the figure 9 caption?

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