

Interactive comment on “Abrupt transitions in an atmospheric single-column model with weak temperature gradient approximation” by Benjamin A. Stephens and Charles S. Jackson

Anonymous Referee #2

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This study examined the behavior of single-column simulations with weak temperature gradient approximation. As SST increases, the column shows an interesting step-wise transition toward a state in which the large-scale condensation dominates. Detailed analyses are shown to reveal the relevant processes. There are some concerns (see below).

major concerns:

1. The main feature of the state transition is the increasing role of large-scale condensation (f_{LS}). However, this quantity is arguably an ad hoc variable due to the artificial separation of convective parameterization. If a cloud-resolving model is used instead

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of a single column model, then there is not a clear separation between convective condensation and large-scale condensation. This issue makes it difficult to assess the implication and generalization of the results of this study.

2. Fig.1a The T profile of the WTG case seems strange. Where is the tropopause and stratosphere?

3. Fig. 2 It seems there is a large-scale descent below 650 hPa. Is that a common feature? It seems depends on the SCM used (e.g., Fig. 5b in Daleu). The lower level descent seems important for the later state transition.

4. section 3.3. Efforts are made to examine the differences between different states. However, an intriguing feature is the step-wise transition. May the authors examine why the transition is not gradual, but step-wise?

minor points:

Line 74. what is θ_s ?

Line 84. which version of CAM?

Line 100. For a single column version of WRF, does the resolution matter? And why?

Section 4 is missing or mismarked?

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