

Interactive comment on “Clarification on the generation of absolute and potential vorticity in mesoscale convective vortices” by R. J. Conzemius and M. T. Montgomery

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Perhaps the most major comment was concerned with the convective-stratiform partitioning method. Indeed, during our initial analysis, we chose a method that was meant to be rather simple and provide a basic look at the problem. More complete partitioning analyses have been done in the past, and we agree with the reviewer that our results would be much more defensible if we used similar methods. We have therefore revised the analysis technique to be consistent with partitioning methods that have been used in the recent literature. The results are now included in the revised version of the paper. The new technique is that used in Wang, Montgomery, and Dunkerton (2009) (a

C1987

submitted paper in review). The technique is the same as used in Tao et al. (1993).

Tao, W.-K., Simpson, J., Sui, C.-H., Ferrier, B., Lang, S., Scala, J., Chou, M.-D., and Pickering, K.: Heating, moisture, and water budgets of tropical and midlatitude squall lines: comparisons and sensitivity to longwave radiation. *J. Atmos. Sci.*, 50, 673-690, 1993.

The reviewer also suggested we smooth the vorticity field prior to calculating the budgets. The budgets should already be smoothed somewhat by the fact that the integrals were calculated over an approximately four hour period. We have also conducted the computation on the coarse domain since it is essentially a smoothed version of the high resolution domain, but the time resolution on the coarse domain is not as good.

There is some sensitivity of the budgets to the placement of the southern portion of the line integral. Although encompassing the entire MCS would remove this sensitivity (and since the northern, cyclonic vortex dominates any anticyclonic motion that would appear at the southern end), we wanted to focus the analysis area around the emergent MCV itself. Thus, we chose the southern portion of the closed loop integral to be along the mid-tropospheric rear inflow jet and prefer to keep it that way. If there is some “noise” in the analysis due to small centers of intense vorticity crossing the southern line, we think it is best to just let the analysis reveal that it is there. It is clear that the storm scale vorticity can have an impact on the vorticity budget, but the consistency of positive contribution from the flux convergence term reveals that it is the dominant term.

Other comments: 1. Page 7537, just above section 3: How is the “isolated vortex” different from the other case? The authors shouldn’t assume that the reader has read the earlier paper by Conzemius et al.

RESPONSE: Thanks for noticing this. We have now added a brief summary of the difference.

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2. Page 7538, equation (2): The second cross product should be a dot product instead.

RESPONSE: This is an error that we did not catch during the typesetting phase of the manuscript. We will make sure that it is corrected in the final version.

3. Page 7539, 3 lines up from section 3.2: “low-levels” → “low levels” (this is a noun, not an adjective, in the present context).

RESPONSE: We have corrected this according to the reviewer’s suggestion.

4. Page 7540, second line of section 3.3: “Since the potential vorticity time tendency...” The terminology can get awkward here; what is really meant is the time tendency of “potential vorticity substance density” (ugh!) or the time tendency of potential vorticity times density (marginally better!).

RESPONSE: We have made this correction, but due to the change in convective/stratiform partitioning method, this section will be further revised in the final version of the paper.

5. Page 7544, second paragraph: “...convective contributions are relatively large at first but acquiesce to stratiform contributions...” – “acquiesce” doesn’t sound right—how about “evolve” or “change” or “convert”?

RESPONSE: This section will be revised according to the change in the stratiform/convective partitioning method. We liked “acquiesce”, but “evolve” also sounds good.

6. Page 7546, paragraph 3 of Conclusions: “Some significant difference” → “Some significant differences”.

RESPONSE: Thank you for catching this error. We have corrected it in the manuscript.

7. Page 7547, last line of text: The mention of “BAMEX” without a reference is not appropriate. Either provide a reference and explain the acronym or omit this sentence completely.

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RESPONSE: We have added the appropriate reference to this experiment. Thanks for catching the omission.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7531, 2009.

C1990