Dear Prof. Vogel,

Thanks again for handling our paper so nicely. We were glad to see that both of the reviewers appreciated the changes done in the revised version and that you accept the paper for publication. We would like to thank the reviewers for their efforts and important comments. Below, please find the comments of the reviewers followed by our detailed point-by-point reply.

Reviewer #1

1) The additional information/qualifiers added by the authors address most of my concerns and I think the manuscript can be published more or less as is. I do think that there is still some misunderstanding about the advantages of conserved variables in modeling/analysis of this type, however. Specifically, the sentence on p. 8, line "For this purpose, the model solves the first law of thermodynamics directly", seems to indicate that using a conserved variable in for the energy equation is less accurate. That isn't true, as Betts (1974) showed, using the first vs. the second law has implications about whether energy is dissipated locally or globally, but there's no reason why temperature determined by integrating conserved variables is any less accurate than conserved variables determined by integrating the temperature (and in fact your equation A1 is just a statement of the 2nd law of thermodynamics for dry air assuming a reversible process (see Hauff and Hiler (1987) for a detailed analysis).

Answer: We would like to thank the reviewer for this comment and for the overall review that really helped us improving the paper. We appreciate the efforts invested. As for the way by which we wrote this model: we chose to solve the problem by the described way because we found it convenient and accurate. We are aware of other ways to solve the problem of evolution of a humid parcel before activation. By all means we do not intend to criticize any other way. Specifically not the method of using conserved variables that we use so often in most of our calculations. Following this comment, we changed the sentence in the paper: "However, the purpose of our model was to resolve the parcel motion and to enable detailed analysis of the uptake of water vapor by haze droplets and of droplets activation process. The model solves the first law of thermodynamics directly."

2) To make your Appendix a complete record of your model, you should also:

1) write down your expression for dq in terms of the droplet growth equation and the latent heat.

Answer: Thank you. We added the following to the appendix text:

"The term dq is calculated by multiplying the change in mass of all the droplets (haze droplets and activated cloud droplets) with the latent heat. Namely

A(2) $$dq = L_e \sum_{all\ droplets} dm$$

Where $dm(r) = 4/3\pi\rho(r^3 - (r-dr)^3)$, and $L_e = 10^3 \times (2500.8 - 2.36T + 0.0016T^2 - 0.00006T^3)$ (for T in °C, Rogers, 1979).

2) Write out the full expressions you used for the temperature dependent latent heat and the heat capacity for the air + vapor + liquid mixture.

Answer: As described in the previous answer, we added after the equation for the temperature an equation for describing the term of dependency on the latent heat release (eq. A2). In order to simplify the model we neglected the effect of water vapor and liquid water, and used the heat capacity of dry air (1005.7 J K^{-1} kg^{-1} Bolton, 1980) throughout the evolution of the parcel. This approximation is valid since the fractions of vapor and liquid in the evolving parcel are very small (Pruppacher and Klett 1988). In light of the reviewer's comment, we added it to the revised appendix: "In order to simplify the model, we neglected the effect of water vapor and liquid water on the specific heat (c_p) and used a constant value of dry air (Pruppacher and Klett, 1988)."

3) Add the hydrostatic equation you used to convert pressure to height.

Answer: We did not use a hydrostatic equation in our model. Instead, we used the measured atmospheric profile. At every iteration of the model, the vertical displacement of the parcel was calculated (by multiplying the updraft by the time step). Then, the measured atmospheric pressure profile was used to retrieve the pressure of the parcel based on its height. In light of the reviewer's comment we added the following to the appendix: "Since the model uses measured atmospheric profiles, the pressure is determinded from the vertical position of the parcel at every time step."

Reviewer #2 (Prof. Ulrich Blahak)

From my side, all major points and technical corrections from my earlier review have been addressed satisfactorily. Thank you for your improvements and clarifications. Only a few technical corrections remain for the main text.
An appendix describing shortly the parcel model equations has been added, to address the first reviewer's comments. This is very useful and helps to understand the basic properties of the model. Here I just have two minor comments and some technical corrections (see below).

Answer: We would like to thank Prof. Blahak again for his great comments that helped us making the paper more accurate and clearer.

Minor comments

1) Appendix A, Eq. A2: I think there is a "+1" missing in the supersaturation term in brackets on the r.h.s:

$$\dots \left(S_{v,w} + \mathbf{1} \; - \; \frac{1}{1+\delta} \; \exp(\dots) \right)$$

Answer: Thank you for this comment. Indeed we missed the 1. The mistake was corrected.

2) Appendix A, Eq. A3: I could reproduce this equation under three (minor) assumptions. I think it would be appropriate if you mention these assumptions briefly in the text: If w_v is the water vapor mixing ratio (not the mass fraction), so that $e = \rho_d w_v R_v T$ with index v for “vapor" and d for “dry air", then you

1) approximate the partial pressure p_d of dry air by the total pressure p,

2) $dp/dt \approx -g\rho U$, and

3) $\rho \approx \rho_d$.

Is the assumption 2) also used in the first law Eq. A1, which enters Eq. A3 in the dT/dt term, or is the pressure change diagnosed from the environmental pressure profile and the vertical speed?

In any case, it would be enlightening if you could clarify the physical meaning of the second and third term on the r.h.s in the text. Second term: effect of the adiabatic cooling (Eq. A1) on the saturation vapor pressure. Third term: effect of the parcel expansion on the actual vapor pressure. This helps to understand the sign before the third (U-) term, which would otherwise be counter-intuitive.

Answer: We thank Prof. Blahak for these important comments. Indeed, the mentioned assumptions were made in the derivation of Eq. A(3). In light of this comment, we added the following to the manuscript appendix: “The latter equation is derived under the assumptions that the partial pressure of the dry air equals the pressure of the parcel, the density of the parcel equals the density of dry air, and that $dp/dt \approx -g\rho U$.” In this paper we do not use hydrostatic relation in Eq A(1), but rather use the measured pressure profile combined with the calculated updraft to derive the pressure of the parcel at every time step. In addition, we also added the following to the appendix text: “The second term on the right hand side of the equation represents the effect of the adiabatic cooling on the saturation vapor pressure, while the third term represents the effect of the expansion of the parcel on the vapor pressure. “

Technical corrections

3) Throughout the text: There is not always a space between numbers and units, for example page 10, lines 13 and 14. Also at many other places in the text. Similar thing for spaces around dashes that represent number ranges.

Answer: Thank you. Spaces were added to the revised text in the relevant places.

4) Appendix A, page 27, line 13: Shouldn't Equation numbers in the Appendix be prefixed by an “A"?

Answer: Thank you. The letter "A" was added to all the appendix equations.

5) Appendix A, page 27, line 13: Garbled reference to Table A1

Answer: Thank you. It was corrected.

6) Appendix A: Inconsistent lower / upper case notation for the supersaturation Sv,w throughout the appendix

Answer: Thank you. Corrected throughout the appendix.

7) Appendix A, page 29, line 6 “milliseconds" -> “ms"

Answer: Thank you. It was changed.

8) Appendix A, page 28, line 10 “following term" -> “last term"

Answer: Thank you. Changed in the text.

9) Appendix A, page 29, line 16 I would not call Eq. A5 “the standard formalism" but rather a “widely used approximation"

Answer: Thank you. It is changed in the revised text.

10) Appendix A, page 29, line 24 “Tabel" -> “Table"

Answer: Thank you. It was corrected.

11) Table A1 Symbols δ, ε_m, and Ms are not explained.

Answer: Thank you. We added them to the table.

12) Table A1 Symbol R = The Universal Gas Constant.

Answer: Thank you. Added to the table.

13) Table A1 For clarity, provide a third column with the units.

Answer: Thank you. A third column was added.

14) Table A1 Symbol Sv,w is the supersaturation of water vapor, not of moist air.

Answer: Thank you. Corrected in the table.

15) Table A1 Symbol w_v in Eq. A3 is the mixing ratio of water vapor, not unsaturated moist air. In the end, this difference does not matter in Eq. A3 because the mixing ratio of dry air is always 1, but I would call it differently for notational consistency reasons.

Answer: Thank you. Corrected in the table.

16) Table A1 If I'm not mistaken, WL in Eq. A4 is not the liquid water content but the mass fraction of liquid water, to represent the liquid water drag per unit mass.

Answer: Thank you. We changed it to: “Liquid water mixing ratio in the air parcel”