

## General comments

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).

## Minor comments

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

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

**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.

## Technical corrections

**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.

**Appendix A, page 27, line 13:** Should'n't Equation numbers in the Appendix be prefixed by an "A"?

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

**Appendix A:** Inconsistent lower / upper case notation for the supersaturation  $S_{v,w}$  throughout the appendix

**Appendix A, page 29, line 6** “milliseconds”  $\longrightarrow$  “ms”

**Appendix A, page 28, line 10** “following term”  $\longrightarrow$  “last term”

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

**Appendix A, page 29, line 24** “Tabel”  $\longrightarrow$  “Table”

**Table A1** Symbols  $\delta$ ,  $\epsilon_m$ , and  $M_s$  are not explained.

**Table A1** Symbol  $R$  = The Universal Gas Constant.

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

**Table A1** Symbol  $S_{v,w}$  is the supersaturation of water vapor, not of moist air.

**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.

**Table A1** If I’m not mistaken,  $W_L$  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.