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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Where do winds come from? A new theory on how water vapor condensation influences atmospheric pressure and dynamics" *by* A. M. Makarieva et al.

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Response to comment: Condensation rate and hydrostatic equilibrium of moist air by Dr Makarieva

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1 Introduction

I was hoping that this comment might help me to understand where Equation 34 came from. But there were things that I found unclear. I'll list them below.

1. What is meant by N_v? It is defined in M10 24030 line 12 as saturated water vapor. In its role in the conservation equations 32,33 in M10 saturation is not a requirement, but in later discussion it does seem to be implied. For example, it was said (p 24030 line 15) that assuming T does not depend on x implies that neither does N_v. so I took it that N_v always referred to saturated air. But now (and elsewhere) there is mention of $N_v \to 0$, and that seems to be in dry air, rather than $T \to 0$.
2. I could not understand Eq 3 at all. First, what is meant by equilibrium? Local steady state? No acceleration? But in any of these cases, it just isn't clear why the form of eq 3 is appropriate.

I had no problem with the special case of hydrostatic equilibrium. But the other oddity with the equation is that there seemed to be no restriction on k, so it isn't a condition at all. I decided to treat it as just a definition for the notation k.

3. The same applies to the equations for water vapor and dry air. But I could again treat Eq 6 as just defining notations k_d and k_v.

4. Eq 7 is just algebra using these notations derived from Eqs 32 and 33 (mass conservation).

5. But following Eq 7 there is some new and strange physics. *"Given our assumption that S is linear over N_v"* I cannot see that this assumption has been discussed. But what is the basis for it - or what does it even mean? This comes back to the confusion about whether N_v is saturated. But the assumption makes no sense in unsaturated air. Does it mean linear as temperature varies?

   It is surprising in any case that the precipitation rate should be determined simply by the water vapor content.

6. Again a limit as $N_v \to 0$ - is this in dry air?

7. The logic of Eq 8 seems to say that $1 + \frac{S}{wk_vN_v}$ is constant, and therefore must be zero because of the limit behaviour. But that constancy doesn't follow from the assumed linearity of S on N_v, since k_v at least may not be constant.

8. The multiple dependence of S is explicit following (8). I cannot see the logic here.

I still can't see the basis for Eq 34, and in particular what extra physics makes it independent of Eqs 32 and 33.