Review of "*Updraft dynamics and microphysics: on the added value of the cumulus thermal reference frame in simulations of aerosol-deep convection interactions*"

Model-based analysis of aerosol indirect effects, or other properties of convection in general, typically relies on some definition of an updraft. Often this is done by considering all cloudy points in a model with some threshold vertical velocity value. The authors here use object tracking code to follow individual thermals, offering this as an alternative to the cloudy grid points method. They use this method to investigate some simple aerosol indirect effects in simulations of deep convection. Generally the aerosol effects on the warm part of the storms are as expected, and are fairly consistent between the two methods, but some differences are seen in the upper levels that suggest the thermal tracking method could be a useful way to investigate processes in deep convection

Overall I think the paper is interesting, novel, and sound, but I offer some comments and suggestions below to help improve and clarify the discussions.

Comments:

It seems to me that the authors overstate the importance of their method compared to the traditional approach. There is no "correct" answer in how to do the analysis. Both methods may prove useful for examining different characteristics or different types or regions of storms. It's especially concerning to me that the authors concentrate on the differences in the upper levels, yet this study doesn't at all investigate the ice phase. It's difficult to conclude anything about microphysics in the upper levels of a storm if only cloud and rain are included in the analysis. This merits some mention at least. What implications might the differences between these two approaches offer when examining the ice phase?

Line 170: It doesn't seem consistent that there could be huge increases in nucleation rates, but not in latent heating. Is this being balanced by evaporation?

Line 172: I think it would be better to show at least some of this information. I found myself wondering about the properties of the thermals and the variability of those properties at multiple times while reading, and was frustrated to keep seeing "not shown".

Line 188: While it is likely true that the *convective core* is more tightly linked at upper levels to fewer, stronger updrafts, the fact remains that the additional updrafts not captured as thermals do exist there, and are certainly quite relevant for microphysics. By only looking at the strongest updrafts in the upper levels, it may better capture that core, but is ignoring stratiform processes. It's not clear that one of these methods would be better than the other in general - it depends on the question being asked.

Line 210: I'm not sure that I buy that it's representative of the total mass flux. In figure 4 you show that the profiles have different shapes as well as the difference in magnitude. They are not really looking at the same thing, which is your point, so how is one representative of the other?

Figure 6: How are there 300 individual thermals in this fairly small domain?

Figure 6: With 250m grid spacing, an average radius of 500m doesn't make a lot of sense. These thermals are barely resolved, and this being the average means you are also tracking thermals that are fewer than 4 points across.