

We thank the editor for his comments, we have addressed them individually as a few were more in-depth than simple fixes.

Abstract: You agree with Referee #1's comment that your discussion of MAC is misleading because you look at the dry particles only. I think you should therefore remove the sentence discussing MAC in the abstract and be careful to caveat discussion of MAC in the main text.

The sentence has been removed

Abstract: "BC coating": Please change to "BC coating by hydrophilic compounds".

Done

Lines 56-57: The referees were keen for general statements like this to be made more explicit – i.e., are these smaller-scale studies of cloud microphysics, air quality, or both?

This now reads

"Explicit microphysical models are also used to investigate smaller scale phenomena (such as cloud microphysics, cloud-aerosol interactions and air quality), and ambient measurements are similarly required for constraint and comparison"

Line 69: this seems to be a bit ambiguous: different species of particles? Different chemical compounds forming the coatings?

This now reads

"different chemical species in BB emissions"

Line 74 and elsewhere: please make it clear whether or not this study can say anything about the phase-state of the clouds causing wet deposition. Connect your discussion here to that at lines 361-367.

We have added a sentence

"The retrieved cloud-top phase was ice, but as Plume 3's trajectory passed through the cloud at an altitude of 5 – 7 km, we are unable to speculate on what phase of cloud the plume passed through."

Lines 357ff: please state the approximate height of the air trajectory as it passed through the regions of precip – just to save the reader having to skip back and forth to Fig 1.

See previous comment regarding cloud phase

Line 81: please state for which ice nucleation mechanisms this is true (if all, say all).

We have clarified it is all IN mechanisms

Line 289: for non-native English speakers it might be better to say "were considered to be in [or within] a plume" because, as written it could mean that a subset of in-plume data were chosen.

Done

Line 317: "synoptic-scale" is better, I think.

Done

Lines 320-322. The logic gets a bit circuitous here. If the regime is dominated by convection, as implied by the end of the sentence on line 322, then capturing the frontal uplift is not sufficient (ie the trajectories are not sufficient) to capture the most important microphysical processes. Might it be better to accept the limitations of the Hysplit trajectory analysis and admit that there could be additional effects due to convection? At any rate, it would be much better if this sentence didn't seriously diminish the reader's confidence in the analysis, as it does now.

Lines 323ff: Convection also destroys the coherence of the trajectories and should be included in the list here.

This has been rewritten as follows, and moved after discussion of what the back trajectories show (so the discussion of Plume 3 makes sense):

“Although HYSPLIT can effectively model vertical transport in synoptic-scale features such as fronts, it (nor any Lagrangian model driven by coarse resolution meteorological fields) cannot capture convection (and hence transport) in isolated convective systems (Stohl et al., 2001). The possibility of unresolved deep convective systems, which could also reduce the coherence of the trajectories, may decrease confidence in the exact trajectory of Plume 3, but only for the part of that trajectory before passage through the frontal region. The portion of the trajectory tracing Plume 3 back to a precipitating region of the front, and to the region of fires, is therefore still expected to be robust.”

Lines 345ff: I can see how one could say that Hysplit calculates times at which it is precipitating along a trajectory, but is it true to say that hysplit calculates the rate of precip? I would have guessed that it reads the precip from reanalyses, possibly interpolating in time and space. This might seem like hair-splitting but it is really just to avoid inexperienced colleagues misinterpreting how these trajectory products work.

This now reads

“The HYSPLIT precipitation rates are extracted from the meteorological reanalysis data.”

Line 375: should “emission ratio” be amended to “tracer ratio” to be consistent with the change of name to the subsequent section?

Done

Line 930: Please check status of Franklin et al. paper in ACP/D.

We have updated to ACP

Line 1354: Please amend status of Taylor et al., in AMT/D, if appropriate.

This is still in discussions

Table 2: Please define `sigma_geo` in the caption of the table.

This is now defined in the caption