

## Answer to Interactive comment by Anonymous Referee #1

We wish to thank the Referee for the interest in our work and the valuable inputs on the manuscript. The comment in the following text are italicized and intended and the answers are addressed below them.

*This manuscript summarizes airborne measurements of particle concentration and size distributions above and near the Hyytiälä site in Finland and compares and connects those measurements with concurrent measurements made on the ground. The data and analysis would be valuable to many of the readers of this journal in part because of the long-term and well-documented dataset available from the Hyytiälä research site. This is also different than most other airborne studies in that it was focused almost entirely on NPF events and could thus use optimal flight plans and flight times rather than those representing compromises for various objectives.*

*Though the manuscript is easily understood, there are numerous typos and grammatical errors that would have to be fixed prior to publication. The text is quite lengthy and the figures quite large; there is certainly room for trimming.*

We corrected the typos and trimmed the text.

*I believe that the manuscript could be suitable for publication after several (mostly minor) issues identified below are addressed. I list them in the order of the text, not the order of importance.*

*Page 2, line 15: This paragraph implies that the study to be reported in this manuscript is a longer-term effort with only a small number of comparable projects. But the 2 x 2 month campaigns are really not that different than the majority of airborne projects that commonly span more than a month. Also, the RACORO study (Vogelmann et al., 2012, BAMS) should be cited here as that project spanned 5 months in a specific area.*

We changed that the study in this work is largest in Finland. We added citation to Vogelmann 2012.

*Page 4, line 16: This is the only time I can see that the PSM is even mentioned. Why? If the data were not used for a reason it should be stated.*

This was the first time the PSM was used in an aircraft, and the used inlet line was found to be too long when measuring the sub-3 nm particles. However, we got valuable information how the instrument behaved in varying conditions. We added the reason why the data was not used in this manuscript.

*Page 9, line 25: It seems like it could be useful to graph the averaged profiles as was done and also normalized in some way with respect to the PBL height. So the y-axis could be something like  $H/H_{PBL}$  to more clearly show the change at the top of the PBL. As is, the relative importance of the first of the three identified processes to the gradual change with height is unknown.*

The dataset includes measurements from late winter to summer days. When preparing the manuscript we tried to normalize the altitudes with respect to the PBL, but since the development of the PBL varied a lot with solar radiation pattern and meteorological conditions, we found the that way to present the data unclear.

*Pages 10 – 11: This portion could easily be shortened. I found it much easier interpreting the graphs than the text describing the graphs.*

We trimmed the text.

*(Page 13, line 18): Not a suggestion, but a comment that the observed heterogeneity or patchiness of high concentrations during the NPF events is definitely a highlight of the dataset.*

Thank you for the comment. We sharpened the text also in the abstract.

*Page 17, line 29: I am sure the authors used the trajectories cautiously, but some discussion of the potential error in determining the PBL to FT timing should be included. Perhaps large ensembles could be calculated with slightly different end times/locations/heights and the consistency of the PBL to FT timing assessed.*

The trajectories in this issue were used to indicate if and when the air masses had risen from low altitudes up to the free troposphere, and also compare to the satellite images to see if the trajectory had passed a cloudy frontal area. However, since also the time resolution of the available satellite images is around hours, the single trajectories were considered sufficient. We added a text about the accuracy of the trajectories.

*Page 18, line 15: Just passing through a cloud area should not necessarily reduce condensational sink. It is just as plausible that it would retain the aerosol concentration and reduce the concentration of soluble gas phase precursors through aqueous phase reactions.*

We thank the reviewer of this point. We decided to remove this from the manuscript.

*Page 25, Table 1: Again, no further mention of the PSM identified in the text.*

Please see above comment.

*Page 25, Table 2: Here and in the text the time zone should be stated.*

We added the information of the time zone (UTC+2h).