

## ***Interactive comment on “Vertical and horizontal variation of aerosol number size distribution in the boreal environment” by Riikka Väänänen et al.***

### **Anonymous Referee #1**

Received and published: 6 September 2016

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.

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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.

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.

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.

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

(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.

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.

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

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and reduce the concentration of soluble gas phase precursors through aqueous phase reactions.

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

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

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-556, 2016.

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