

## ***Interactive comment on “Aerosol dynamics within and above forest in relation to turbulent transport and dry deposition” by Ü. Rannik et al.***

### **Anonymous Referee #1**

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The authors model the atmospheric boundary layer and aerosol dynamics above a pine forest in Finland, in order to examine the effect on vertical transport of aerosols, and how this impacts on the interpretation of flux measurements. They find that the vertical transport of particles within and above a forest canopy can be strongly dependent on the aerosol dynamics and measured fluxes deviate from dry deposition. This is an important result and deserves publication in ACP. I would, however, recommend proof reading the manuscript, as I found the language difficult to understand at times, meaning that the points the authors were trying to make were not always clear.

I would also like to see a description of the measurements that were used in the model.

Minor comments:

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Page 19376, line 10: “However, the fact that the model is not able to reproduce the fine details of the particle formation events does not affect the generality of our results.” Could the authors qualify this? If the modelled nucleation modes were not “as clear”, and the particle growth overestimated, I would have thought this could have an impact on the aerosol dynamical term. Are the authors able to quantify this impact, and thus assure the reader that the same conclusions apply?

Page 19376, line 23: “a single mode with the maximum particle amount at around 200nm”, remove “with the maximum particle amount”.

Page 19377, line 13: “The aerosol concentration inside and above forest was homogeneous at noon and small vertical concentration gradients could not be observed from color presentation 15 in Fig. 4a.”. This is presumably from the model results. Are there any measurements to validate this (even from published results)?

Page 19377, line 18: Why “not shown”?

Page 19378, line 3: “normalized to local concentration” – are these modelled concentrations?

Page 19378, line 22: “Note however that the concentration of small particles was very low in the evening” – will this affect the accuracy of the results?

Page 19381, line 11: “exceeding deposition more than ten times” – do you mean exceeded by a factor of more than ten? Use this term instead, as “more than ten times” could be interpreted to mean more than ten occasions.

Table 1: The median values are a lot closer to unity than the averages, suggesting the latter are affected by outliers. Could the authors comment on whether this affects their conclusions?

Page 19384, line 6: “The dominant condensing compounds, OH oxidation products of monoterpenes, resemble a similar profile as monoterpenes and model simulates strongest growth of nucleation mode particles at the same height.” – I’m afraid I didn’t

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quite understand this sentence; could the authors make it a bit clearer. Also is there concentrations and/or profile data for monoterpenes? If so, please show it, or at least reference it.

Page 19384, line 17: "The concentration time change, when summed up from the surface up to the measurement level, is called the storage term and commonly accounted for in estimation of the net ecosystem exchange of carbon dioxide from the EC flux measurements." – A reference would be useful here. Also correct "in estimation".

Figure 2: A label for the colour scale is needed for (a). Please clarify: SMEAR is the measurements?

Figure 3: Correct bottom axis label of (a) "Diameter". Where is nucleation on (b)?

Figure 6: Positive velocity means downward? Please clarify.

Figure 7: There is a lot of variability with diameter in aerosol dynamics and transport timescales. Is there any measure of uncertainty?

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 19367, 2015.