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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Temperature influence on the natural aerosol budget over boreal forests" *by* L. Liao et al.

**Anonymous Referee #3**

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**General remarks**

The paper presents a study about the variation of natural aerosol production due to biogenic emissions from the boreal forest with ambient temperature. With regard to the expected and partly already observed climatic change the topic is of general interest. However, the study is based mainly on model results, only measurements of aerosol number size distributions are used. Thus, the main criticism from my side is that the authors have no evidence to what extent the observed particles consist really of biogenic material. Maybe there are other studies from the same sites with chemical measurements which can be used to strengthen the results. Otherwise it is much speculation about the composition of the particles.



More detailed points are listed below. However, if the authors address the points carefully I can suggest the paper for publication in ACP.

Comments in detail:

**Abstract:**
The abbreviation BVOC should be explained or not used here.

**Introduction:**
A better separation between your work and that from Tunved et al would be nice. Could you please explain briefly the method and results from Tunved and the relation to your study. From this introduction it is not clear, what is new here.

**Measurement and methods:**
Please explain the method here in more detail. How can you be sure that really monoterpenes are responsible for particle formation and growth?
Page 33316, line 1-4: Do you think this calculation of ground level temperature is realistic? I would be skeptical and expect large inaccuracies. Can you try to validate this method by ground based measurements? There should be a few stations on the trajectory way measuring temperature.
Following paragraph: How do you know the monoterpene emissions, also its seasonal dependence? Can you please give a reference or an explanation?
Page 33317: Again concerning the monoterpene emissions: Is there any chance to validate these calculated emissions with measurements?

**Results and discussion:**
Page 33318, line 23: How accurate is the average trajectory temperature? Please give an uncertainty range here?

Page 33318, line 27: Please define ‘MT’, I think I know what you mean, but it helps to have it defined when it is used for the first time.
Page 33320, lines 1-6: Whats about new particle formation at the sites? We all know the nice banana-plots from Hyytiälä, but your figures look quite different? How does new particle formation at the site influence your results?
Following paragraph: I also think that the growth rate is very low and your following discussion does not convince me. Maybe the growth rate is highly variable between ground and higher altitudes? At ground sites usually higher values are observed. If you think you deviation in the GR comes from taking the whole data set, can you calculate it for individual cases only?
Section 3.2.2: The used monoterpene concentrations are obtained from the model, right? It is a bit confusing to, because these modelled MT values are used together with measured particle concentrations.
Page 33324, line 20-25: Why is the aerosol yield higher for lower temperatures? This is not obvious to me.

**Summary and Conclusion:**
From this section it sounds that the new particle formation always starts above the ocean and particles grow over land and are finally measured at the site. Whats about nucleation over land?
I expect also other compounds to contribute to particle growth beside the biogenic emissions. Can you quantify this or is this really negligible?

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 33311, 2013.