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Atmospheric Chemistry and Physics Discussions

Interactive comment on "

Isoprene in poplar emissions: effects on new particle formation and OH concentrations" *by* A. Kiendler-Scharr et al.

Anonymous Referee #1

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In this research, an effect of isoprene on new particle formation and OH concentrations was studied. Normal Grey poplar with a high isoprene emission and transgenic poplar with an inhibited isoprene emission were used as VOC sources in the plant atmosphere chamber experiments. Prior to experiments, poplars were exposed to a high ozone concentration to induce and increase monoterpene and other VOC emissions from trees. A laser-induced fluorescence (LIF) method was used to measure OH concentrations during the experiments. Furthermore, an experiment with fully deuterated

isoprene was conducted in order to study SOA formation yields of isoprene.

The study presents novel and important results on isoprene chemistry and SOA formation in the atmosphere. Chamber and field experiments have indicated that isoprene can suppress particle formation and thus this research is very important. Biogenic VOC and SOA have a significant impact on Earth's atmosphere and climate. The manuscript (MS) is well organized, written and the scope of MS is suitable for publication in this journal. Furthermore, the experiments have been well designed and conducted and the results quite well reported and analyzed in the MS. Therefore, MS is certainly suitable for publication in this journal. However, there are some minor comments and suggestions that should be considered before publication.

General comments/suggestions:

Please compare VOCs, O3 and OH concentrations in the chamber during the experiments with typical values observed in the atmosphere. How reasonable are values? Generally, VOC emissions can be very high after biotic or abiotic stress.

It is stated in MS that isoprene suppresses new particle formation but not growth in the present experiments. What are (possible) reasons that isoprene inhibit nucleation but not growth of particles? (page 22429, line 23)

Could you clarify why isoprene is less efficient in quenching new particle formation when emissions contain sesquiterpenes and aromatic VOCs compared to monoterpenes? (page 22431, line 9-16)

Geoengineering is nowadays a very interesting topic in the atmospheric science. I feel that genetically modified trees and plants could be used to increase emissions of reactive VOC (or decrease isoprene emissions) to the atmosphere and hence increase SOA loading which can lead to an increase in cloud condensation nuclei concentrations, etc. Could you speculate the use of genetically manipulated trees in the field of geoengineering?

Specific comments:

Abstract:

1) In the second sentence, there is mentioned a high nucleation rate observed in the experiments. However, it is not clearly indicated is the results from high or low concentration isoprene experiments. The better place of information of nucleation rates would be later in the abstract. Also, values (or magnitude) of nucleation rates for high isoprene concentration experiments should be also mentioned in the abstract and/or in the text later. Furthermore, VOCs, O3 and OH concentrations during the high nucleation rate experiment should be mentioned in the MS.

Introduction:

2) Page 22421, line 6-: Please specify how common species are poplars in globally. Are they globally important trees?

Experimental:

3) Page 22424, line 2: Acronym GC-MS is not explained.

4) Please clarify or an insert appropriate citation how emission rates (μg(C)/m2s), number efficiencies and incremental particle mass yield have been calculated.

Results and discussion:

5) Are errors/deviations indicated after number values, e.g. 1.6 ($\pm$0.6), standard deviations, standards errors or something else. Please clarify.

6) Page 22428, line 12, eq. 1: Please clarify a meaning of the coefficient 1.5 in the equation.

References:

7) There are Atmos. Chem. Phys. Discuss. papers that have already been published in Atmos. Chem. Phys. (Kanawade, Whalley).

Figures:

8) Fig. 1. For comparison, similar plot for transgenic line poplar would be nice to see, too.

9) Fig. 1. Concentration of MT is so low that the changes cannot be seen. Multiply it by 10 or insert secondary y-axis for MT.

10) Fig. 3. Purple shaded area is not explained in the figure caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22417, 2011.