Atmos. Chem. Phys. Discuss., 8, S6640–S6643, 2008
www.atmos-chem-phys-discuss.net/8/S6640/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Emission of sunscreen salicylic esters from desert vegetation and their contribution to aerosol formation" *by* S. N. Matsunaga et al.

Anonymous Referee #1

Received and published: 3 September 2008

The paper deals with the possibly important emission of biogenic volatile organic compounds from desert plants, here with two salicylic esters. It is found that two of the investigated species show high emission rates and that their contribution to the total SOA formation from BVOCs might be substantial in desert regions.

The paper is of interest for the scientific community because secondary organic aerosol formation is an important process that is relevant for a large part of the observed aerosol mass. There is still not enough known about the emitters of biogenic organic compounds and about the aerosol formation that subsequently happens.

Although the paper might contribute important new aspects with regard to the role of

desert plants in biogenic emissions, the authors could not make sufficently clear that their method to derive SOA emission rates is scientifically sound. In particular I am missing a classification of the derived SOA from salicylic esters in comparison with other SOA formation by BVOC emissions. Even if the relative contribution of the salicylic esters to the total BVOC emissions is high in desert regions, it might be negligible in the context of other BVOC emissions and of other aerosol sources in deserts. Additionally, the description of the experimental part leaves many questions open. The authors should significantly extend their paper and discuss these and the points mentioned in detail below before the paper can be accepted.

Special major comments:

13620, line 19: "... the salicylic esters are predicted to be effective precursors ..." As far as I understand this is assumed or deduced from sesquiterpenes but there is no evidence given that this is true

13623/24, Experiment:

The experiment is not clearly enough described. How many samplings were done per plant? If only one per plant (as I assume) this might not be representrative for the whole plant. Were the experiments also done under different conditions, particularly under different temperatures?

Figure 1 and the description in section 2.1 are difficult to understand. If there is an inflow of 720 ml/hr and an outflow of 220 ml/min plus 300 ml/min: what about the rest? Were the volumes measured and their fluctuations considered in the evaluation? In line 13/14 I cannot distinguish between the VOC analysis (at 220 ml/min) and the analysis of "another portion of air" (how much???) by taking samples and subsequent analysis by GC/FID. Which VOCs have been additionally analysed. What were the results?

The extracts were concentrated to less than 2-3 microliters. This seems to be a very small volume. What are the implications, particularly with respect to possible losses

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during the concentration process?

A description of the QA/QC activities and the overall uncertainty is almost competely missing. How did the retention time vary? What about recovery rates of the used internal standards? I do not understand how the "loss factor" was determined and what the uncertainty of this factor is. What is meant by "the uncertainty due to the concentration process could be standard deviation of 10 - 15 %"?

Figure 1 indicates that the sample was taken at 220 ml/min, but that another line goes to GC/FID. I understand in the text that the sample was analysed later by GC/FID. What is correct?

Figure 2: Are these mass spectra of the standards or of the samples? How do the spectra of standards and samples compare?

13625, Emission model:

What about the land cover inputs? Does this refer to the desert plants under investiagtion or to the land cover of the whole Earth? What is the role of Maria Papiez? If she contributed to the paper she should be co-author. Otherwise she should be acknowledged or cited.

13625, equation 1: How can you be sure that the equation is valid for the esters? It has been measured for sesquiterpenes and it is not clear whether the physico-chemical properties of them are comparable. The emission factors in Table 1 strongly depend on this equation. Why has the temperature dependence not been measured instead of making this assumption?

13625, line 24: It should be said that T is given in K in equation 1, because degrees C are used in the rest of the paper.

13626, section 3.2: The application of the model for this particular case needs to be decribed. How long was the simulation, which temperatures were prevalent? Which was the SOA yield? How big is the uncertainty of this number? It is verified to take the

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SOA yields from SQT? How large are the abolute emissions? How do they compare to other BVOC emissions from other species at other places (in the US)? Which other BVOC emissions by these plants exist and may be of importance and how have they been taken into account? These are questions that need to be answered before the reader can judge how important these emissions are in the context that has been described in the introduction ("impact on regional air quality and global climate").

13626, Conclusions line 23: As far as I understand its just a hypothesis that they are important for SOA formation, the SOA yield has not been shown nor has it been made sufficiently clear that there is good reason to take the SQT SOA yield. Additionally, they may be only important in deserts (whrere no other BVOC emission exist). This must be made more clear.

Fig. 3: I am missing some geographical information like coordinates or scale. Additional information on the time/averaging period etc. would be helpful. In the text, it is said that the salicylic esters contribute at least 25 % to the total BVOC SOA in many regions. This Figure indicates that most regions are between 6 and 18 %.

Minor comments:

13620, line 13: explain the unit dwg 13620, line 23/25: What is the difference between Las Vegas area and Las Vegas region? 13626, section 3.2: It is Fig. 3 (not 2).

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13619, 2008.

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