Atmos. Chem. Phys. Discuss., 4, S3574–S3577, 2004
www.atmos-chem-phys.org/acpd/4/S3574/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Temperature and light dependence of the VOC emissions of Scots pine" *by* V. Tarvainen et al.

V. Tarvainen et al.

Received and published: 4 February 2005

We wish to thank the referee for his/her constructive comments and suggestions which led to a significant improvement of the initial manuscript. The comments and questions of the referee are addressed below under their respective titles.

General Comments:

The presentation of the results has been restructured (see below). As to the extension of the description and discussion to other compounds than monoterpenes, we feel that the data presented on those compounds in this paper is quite limited and in many cases still tentative, thus permitting only speculative discussion. Since there is and will be much more data available from measurements carried out since the QUEST campaign,

we will be able to address the other compounds in more detail in our forthcoming papers. However, a mention of some additional compounds has been included in the manuscript (see below).

Specific remarks and questions:

The abstract has been shortened.

2. Materials and methods

A description of the placement of the enclosures and the adaptation period has been included in the text, and the handling of the samples prior to analysis is also described. The detection limits of the various compounds are now given. There were very few unresolved peaks that could be mono- or sesquiterpenes in the chromatograms, thus the likelihood of significant contributions of unidentified species is very small.

3. Results

We completely agree that part of 3.3 was method description rather than results and lost no time in relocating it to the appropriate section. Other than that, section 3.3 has been restructured so that the first part now discusses the standard emission potentials, their variability, and other related issues and the second part deals with the applicability of the emission algorithms and their performance with the different compounds.

3.1 Observed emissions

Emissions of other sesquiterpenes were observed during the measurements and even though they were only tentatively identified, a comment on their relative emissions has been included in the text. Also a description of the meteorological (mainly temperature) conditions during the respective measurement periods in Sodankylä and Hyytiälä has been included in the text as they may explain some of the observed differences at these two sites.

3.2 Light dependence

ACPD

4, S3574–S3577, 2004

The temperature during the darkened enclosure experiment has been included in Figure 2. As the temperature was steadily decreasing and continued to do so after the darkening, it can not explain the drop and recovery of the monoterpene emission rates during the first 4 hours in the dark. Neither can it explain the difference in the morning emission rates between Aug 7 and Aug 8 as the temperature was essentially the same as on the previous day right after 8 o'clock on Aug 8 when the MBO and caryophyllene emissions were already high. The removal of the cover did not disturb the branch - in fact, the branch moved more when the cover was put in place, and there was no emission burst following that. The results, however, are now also discussed in light of the stomatal conductance model of Niinemets and Reichstein (J. Geophys. Res. 108(D7), 2003) which might shed some light on the behavior of the emissions.

3.3 Calculated emission potentials

The statement about the emissions being measured in the afternoon was inaccurate. Generally the emissions were measured around noon. Sometimes the measurements were started already in the morning and sometimes they were carried out until the evening but the noontime measurements were always there. This is now stated correctly in the text. As a side note, all times given in the paper are local times, which means that the solar noon, Finnish summertime, would coincide with 1.30 p.m. The range of light intensities (varied between 0 and 1800 micromoles photons per square meter per second) and also temperatures (varied between 268 and 308 K) in Hyytiälä is now also given in the text to indicate the range of the environmental conditions covered by the measurements. However, we did not include scatter plots as their informative value besides the respective ranges was considered small. The origin of the springtime high emissions was speculated from the point of view of the emission algorithm and its inability to reproduce them with seasonal average emission potentials. The increase from summer to autumn, on the other hand was better captured with the model, thus causing us less concern. As to the temperatures during the autumn measurement period, there was nothing exceptional about them - rather, they were close to the

ACPD
4, S3574–S3577, 2004

long term averages. The performance of the pool algorithm with the 1,8-cineole data is now included in the text. We completely agree that the data on cineole in this study are rather few, and therefore consider our conclusions about it extremely tentative. A discussion of the levels of observed emissions vs. earlier work is now included in the text.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6691, 2004.