

Interactive comment on “Ozonolysis of α -phellandrene – Part 2: Compositional analysis of secondary organic aerosol highlights the role of stabilised Criegee intermediates” by Felix A. Mackenzie-Rae et al.

Anonymous Referee #2

Received and published: 19 September 2017

Review

The study by Mackenzie-Rae et al. presents interesting new results on the chemical composition of SOA from ozonolysis of alpha-phellandrene. In general the results are well presented and discussed, though it is somewhat disappointing that a manuscript authored by several native English-speaking persons contains a number of grammatical errors and unclear sentences. I recommend that the work is published after the following points have been adequately addressed.

C1

Page 1 Abstract: The abstract must mention that the study only investigates water-extractable components of the SOA.

Page 1 Line 16: Why is quadrupole written with capital first letter? Since it is not used for an abbreviation, nor is it a name, lower case would be more correct.

Page 1 Line 29: "around Eucalypt forests regions" -> please correct the grammar here

Page 2 Line 13: "One monoterpene for which little study has been conducted is α -phellandrene." -> please rewrite to make the sentence more clear and correct

Page 2 Line 17: " Believed then to be of particular importance is the abundance of α -phellandrene in extracts of numerous species of Eucalypts" -> please rewrite to make the sentence more clear

Page 2 Line 28: "However, postulated gas-phase species could not explain the properties of the SOA observed." -> please make it clear that you refer to the companion paper here.

Page 3 Line 6: Please also refer to some of the first studies that applied this technique to aerosols.

Page 3 Line 8-9: I suggest to remove "and relevant to the current discussion"

Page 3 Line 25-30: The storage temperature is higher than often used in other studies (-18C). For how long were the samples stored and can you comment on the possible influence on the analytical results?

Page 3 Line 29: Why were the filters only extracted in water, not a polar solvent? It is important that this is emphasized throughout the manuscript - unless the authors have results showing that most of the SOA is actually extracted by this method. If so, those results or previous studies should be mentioned.

Page 4 Line 1: Was the effect of "evaporation to dryness" on molecular composition of samples investigated?

C2

Page 4 line 6: "reverse-phase" should be corrected to "reversed-phase".

Page 4 line 9: Did you actually inject 30 mL? Please provide dimensions of the column and eluent flow rate.

Page 4 line 15: How frequently was the mass calibration done? Please be specific.

Page 4 Line 19-20: It seems strange that you mention methylation during extraction, when you extracted in water. The influence of adduct formation with methanol was further investigated by Bateman et al. (2008) and Kristensen and Glasius (2011), also showing that methanol esters can form during HPLC analysis.

Page 4 Line 23: "Because all first- and second-generation products of α -phellandrene ozonolysis contain at least one functional group that is capable of ionisation (Mackenzie-Rae et al., 2016, 2017a), it is reasonable to assume that a high proportion of water soluble SOA components will be observed..". Especially the first part of the sentence is quite a bold statement, which should be modified. The next sentences on ionization must be shortened to avoid repetition.

Page 5 Line 19: "mass spectra are" or "mass spectrum is". Please correct.

Page 7 Line 9: Can you add a reference where the loss of 88 Da is observed from diacids?

Page 7 Line 18: Since the vapour pressures have not been measured, please change to "estimated low vapour pressures".

Page 7 Line 30: Has this process not been investigated since it was suggested in 2008?

Page 8 Line 21: "it is not unreasonable to assume enhanced partitioning of these prominent intermediate-volatile gas-phase species". What do you mean by enhanced? Compared to what?

Page 8 Line 30-31: The last sentence is quite unclear.

C3

Page 9 Line 2-3: "Whilst the SOA analysed consists of a complex mixture of compounds, chromatographic analysis suggests that the SOA is dominated by a small number of major constituents." Please write more clearly what you mean - is it a complex mixture or a small number of major constituents?

Page 9 Line 5: Please mention the tool you used for this, since these estimates vary considerably.

Page 9 Line 15-16: Please clarify this sentence.

Page 10 Line 25-26: Please order these references by publication year.

Page 16 Line 6: Please add information on the reaction rate with water.

Additional reference: The study of Zhang et al. (2015) provided new information on molecular composition and dimers in monoterpene SOA and is suggested as an additional reference.

Figure 3: The first step needs additional information.

Table 1: It should be clear from the table caption, that most of this information is from the companion paper.

References: A.P. Bateman et al., *Environmental Science and Technology* (2008) 42, 7341-7346 K. Kristensen and M. Glasius, *Atmospheric Environment* (2011) 45, 4546-4556. Y. Zhang et al., *Proc. Natl. Acad. Sci.* (2015) 112, 14168-14173.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-654>, 2017.

C4