

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2022-478-RC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2022-478

Anonymous Referee #2

Referee comment on "High variations of BVOC emissions from Norway spruce in boreal forests" by Hannele Hakola et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2022-478-RC2>, 2022

The manuscript reports an important new viewpoint, especially on the emission of sesquiterpenes from Spruce and the potential consequences on new particle formation and SOA growth. Unfortunately, the manuscript is written kind of carelessly, like in a very big rush. There are obviously rearranging issues with non-fitting subsection numbering. At many places, the text jumps back and forth, or, terms are defined after they are already used. Explanations needed in the methods description appear in the results or even discussion as footnotes etc. All that lead to the point that it is not clear what the aim of this paper is! Maybe this is also the reason that the paper's title is very superficial.

The measurement and data part would need a more clear focus how all goes together. At the moment it's hard to assess if there are repeated measurements, how many? Some are repeated after longer time to check for changes by age etc. The quality of these data can not be assessed at the moment and therefore it remains unclear if the differences found are really effects or occurred by chance.

The modelling part would need some clarifications. Did you model monthly or daily time steps? Or both. Which model was used? Basically the first part of the presented equations are a temperature driven parameterisation according to Guenther, as stated. This part somehow deals with the scaling of the measured emission factors to scale them by temperature for comparison with published and older data, as I get it. I kind of understand that MEGAN was used to create another set of emissions that is processed with the second part of equations given for the aerosol growth predictions. In general, the modelling part does not give any grading on the quality of the model or models used in relation to the input parameters. Especially as there are many assumed relations like constant values per month in some input data, constant specific leaf mass, scaling factors between HOM and SOA yields and so on.

Specific comments:

Line 91, which models/equations were used to make this aerosol formation and growth calculations from measurements? The one you present or MEGAN?

Line 175ff, need more details here. First, do you use a "trap" or a "cold trap"? According the procedure described, you sample into a "trap" filled with adsorbents keeping the temperature high enough to avoid condensation. Then, after that, the sample is pushed to the thermodesorber part, that, usually means a heating up and then cooling down below zero before entering finally the column in a GC-MS system. Using a "cold trap" directly would mean, to my knowledge, to use low temperatures while sampling.

Line 215ff, here, it's a bit puzzling because you describe the emission factor with a unit of ng per g dry weight and hour, I guess. Then in the next section you use the emission factor with micro gram per square meter and second. The conversion factor comes very late (line 637) in the footnotes of table 5. I would leave some information already here that this conversion is needed to get on to the next step, the model.

Line 250ff, in the section, you describe the constraints, i.e., data used for the parameterisations. It is very puzzling which time scale was used, daily or monthly or both? You use "monthly median", "daily maximum" and "monthly median of daily maximum" to express these scales but there is no clear description how the model is using them?

Line 303, the temperature is linked with the reaction rates in table 1. It's better mentioned there in the caption, not together with the chemical reaction schemes.

Line 325ff, here, you present the gamma values, and that these have multiple values possible as I understand, they are further numbered as well and state to present HOM, or as SOA yields. However, that makes the need to have another constant (2.2) in to account for. It may be ok, but somehow this lacks a clear reasoning and description of how such changes in model parameters will impact the model's output.

Line 358ff, it's a bit strange to define CC after it is used in an equation, that makes the reader searching for it in subsequent equations. Usually, if given in that notion, this is a "side-parameter" and do not need and have an own equation number. It would be beneficial to introduce it before, i.e., renumber also the equations.

Line 450, usually, box plots use medians, as stated later in the caption also. I would somehow rephrase and skip the "Monthly mean" at the beginning of the caption.