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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical characterisation of atmospheric aerosols during a 2007 summer field campaign at Brasschaat, Belgium: sources and source processes, time series, diel variations, and temperature dependencies" *by* Y. Gómez-González et al.

Anonymous Referee #1

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General Comments

This work presents measurements of secondary organic aerosol components in a forested setting affected by anthropogenic pollution. As such, it provides a unique environment for investigating compounds such as organosulfates, which can form from biogenic and anthropogenic emissions. The quality of the analytical chemistry is very high, as is the writing. The most substantial improvements can be made with respect to

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presenting the argument for temperature control over SOA formation and with a more complete introduction. With the following minor changes, I recommend this paper for publication.

Specific Comments

Abstract- The abstract contains too many technical details that should be left to the main text. Because of this, the impact of the work is lost. I recommend omitting the sentence beginning on line 6, "The objectives. . ." as this work is not an overview on the study but rather a focused work on a specific set of analytes. This sentence should appear in the Introduction.

For same reason as above, omit the sentence beginning on line 14, "The measurements of MSA. . ." as these details can be left for the Methods section. Since the work is not focused method development, this is not needed in the abstract.

For same reason as above, omit the phrase beginning on line 23, ". . ., except the MW 295. . ." and on line 2 (next page) "the exceptions" to the end of the sentences. For the abstract, it is sufficient to say that most of of the terpenoic acids peaked at day time without listing those that did not. Is also sufficient to say that temperature correlations for some species were observed without listing all exceptions.

Regarding the correlations among organic species referenced in the abstract, it would be more impressive to give the implications of high, very high, or substantial correlations rather then simply stating that they were observed. This is especially true since no particular species are listed. One would assume that in any study, some organic components would be correlated. If the authors could draw one or more interesting conclusions from the correlations, they could state that "X and Y were correlated, indicating . . ." which would give readers a better indication of the findings. Otherwise there is no point in drawing attention to the correlations.

The final sentence of the abstract is awkward. Consider rephrasing as, "It was found

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that MBTCA and terebic acid showed an Arrhenius-type relationship with temperature" or something to that effect. Emphasize the finding rather than all that was explored.

These changes should tighten the abstract and present a more focused paper.

Introduction-

The sentence on line 15 beginning "Comprehensive" is out of place. It belongs at the start of the Introduction. In the current location it cuts between the goals of the current study and the measured species, which belong together. With respect to this statement, have any papers been published from the BEARPEX study in California that might relate to the BIOSOL project?

In the description of the BIOSOL project, the objectives listed are fairly generic. Most field studies look at sources, time series and diel variations of aerosol species, gases, and meteorological parameters. The uniqueness of this study certainly merits unique objectives and specific scientific questions. The motivation behind this work could be highlighted here by describing the objectives that drove the authors to measure MSA and the specific terpenoic acids listed. Further, the introduction is lacking a framework of background information on the species measured or the type of questions being addressed. The authors have not done themselves justice in omitting these details.

Omit the sentence on line 25 beginning "The measurements of MSA" as this belongs in the Methods section.

The second paragraph of the introduction is very well done. If the first paragraph is expanded and modified as suggested, it would read very well.

Section 2.2, Meteorological and Trace Gas Measurements

pg. 23547, lines 20-26 - Since the aerosol composition and quantity varied so drastically between the first 10 days and the remaining sampling days, it is important to emphasize whether or not the transport pattern (wind strength and direction) changed. This would help to convince readers that the local temperature change is what drove

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the observed chemical differences, rather than temperature coinciding with large scale meteorology and therefore being only correlative (not causative) in the observations. The authors state that the direction was "mainly from the southwest" but it is not well established that the wind direction remained constant from the first period to the second.

Section 3.1, Measurement of terpenoic acids and organosulfates First sentence: add references to other forest studies where the chemical composition has been investigated.

pg. 23553, lines 1-5 - Rather than repeating and/or it would be more appropriate to say, "The high value at Brasschaat suggests that one or more of the following are occurring: (1) the source regions of MSA precursors. . . (2) the source strengths . . . (3) the conversion to MSA . . . and (4) less removal by wet deposition.

pg. 23554, line 2 - insert "can" before "lead to enhanced." Again, it would be relevant here to emphasize that a change in the transport direction (source change) was not the cause of the chemical changes but rather the change in local temperature. This would strengthen the final points of the paper as well, since there is a focus on the Arrenhius relationship.

Section 3.3 An additional figure with diurnal trends would be very helpful to distinguish the 3 categories of compounds. One panel for those with trends, one for daytime peaks, and one for nighttime peaks would be very illustrative of the differences observed.

pg. 23555, paragraph 2 It is worth pointing out that the concentration of organosulfates was equal to that of terpenoic acids, perhaps even in the abstract. The fact that they contribute equally to OC is notable.

Section 3.5 The activation energies presented here are hard to interpret for anyone not immediately studying Arrenhius behavior. It is worth a sentence or two describing their role in interpretation of data and what one can conclude by comparing them. The list of

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"this is higher than that" is not useful without interpretation of what these comparisons mean. If the comparisons find significantly new information, that should be presented in the abstract as "activation energies were compared to determine.. and . . . was found"

Conclusions

I am uncomfortable with the authors stating that "temperature was a main driver in biogenic SOA formation at the study site" as less than 5% of the OC was characterized in total, and only a fraction of the characterized OC showed a strong temperature dependence. This is an over-statement and should be scaled back. Despite the overall correlation between OC and temperature, it would be more appropriate to say that for the characterized species, temperature was a main driver, while for OC overall, it was correlated. Without speciation, I don't think the temperature can be proved to be a cause of SOA formation.

Technical Corrections

pg. 23543, line 12- omit "and" between "(MSA)" and "(iii) since there are 4 items in the list, not 3.

pg. 23544, line 8- replace "of PM2.5" with "on PM2.5"

pg. 23546, line 19- insert "carbon" after "inorganic"

pg. 23546, lines 14-21 - this is a run-on sentence and is awkward. Please separate and rewrite.

pg. 23550, line 22 - omit "of the supplement" since it's redundant with the notation Table S1.

pg. 23553, line 12 - start a new paragraph with "When the samples are separated"

pg. 23554, line 21 - insert "temperature" after "cooler night time"

pg. 23555, line 29 - insert a comma after "campaign"

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