Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-1187-RC3, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical characterization of oxygenated organic compounds in gas-phase and particle-phase using iodide-CIMS with FIGAERO in urban air" *by* Chenshuo Ye et al.

Anonymous Referee #3

Received and published: 24 December 2020

This paper presents a detailed characterization of gas- and particle-phase compounds in Guangzhou, based on FIGAERO-I-CIMS measurements. The presence and behaviour of a large number of different groups of compounds observed during a measurement campaign in October and November 2018 are outlined. Compound classes discussed include those deriving from biomass burning, species formed from oxidation of biogenic and anthropogenic VOCs, sulphate-containing species and others.

This paper will provide a valuable reference for future field studies on urban air quality in China and elsewhere. Only a small number of datasets exist for this instrument in

Printer-friendly version

Discussion paper

urban environments, which makes detailed results like those presented here a valuable addition to the literature. The breadth and detail of the FIGAERO-I-CIMS calibrations are particularly impressive and the descriptions of how these were done comprise an important resource for future CIMS studies. The experimental setup is well-considered and robust. The number of different compounds and ideas presented in this paper is comprehensive, but to an extent it sacrifices depth and continuity between ideas in order to achieve this. I would therefore recommend revisiting the paper's "bigger picture" and making the links between each section and the next clearer to make the paper more cohesive.

This paper will certainly be of interest for readers of ACP and I therefore recommend publication after the comments outlined below have been addressed.

General comments

(1) While each of the individual observations presented here is interesting and valuable, they have not been linked together into an overall storyline, which can leave the paper feeling disjointed. It would benefit from more discussion about how these disparate observations are related to one another and a more concise description of the overall picture in the conclusion.

(2) More could be done to examine the environmental factors leading to each of the observations presented in the paper, as well as discussing the ramifications.

(3) There are a very large number of figures associated with the main text. In addition, some of the supplementary figures actually seem more relevant than those chosen to be included. I would recommend looking again at the figures both in the main paper and in the supplementary materials to establish which are the most important and contribute the most to the overall storyline. Including fewer figures with the main text might make the key results easier for the reader to identify and digest.

(4) Overall, this paper is well-written and the ideas are clearly-presented. However,

there are quite a few typos and grammatical errors, so it would benefit from another read-through to identify and correct these.

Specific comments

1. Line 3: It might be worth stating the location of the measurements in the title, to give potential readers more context.

2. Lines 56-7: I don't fully understand the sentence "oxygenated organic compounds provide a vital link between advanced chemical mechanisms and the model-observation discrepancy". Are you saying that OOCs are not accounted for in models and this explains discrepancies between models and observations? If so, how is this shaping the model results? This needs to be a little clearer and more fully-explained.

3. Lines 120-1: This technique could do with one more sentence of explanation.

4. Line 132: Here, 'diel' is used to refer to typical changes over a 24 hour period, but elsewhere in the paper 'diurnal' is used for the same concept. Either of these is fine, but it would improve clarity if the same word was used throughout (unless they are being used to mean different things, in which case this should be explained).

5. Section 2.2.2: The detail in this section is fantastic, as the FIGAREO-I-CIMS calibrations were carried out much more fully than is typical. This is likely to be extremely valuable as a resource for CIMS users in the future. Given this, it might be beneficial to include a table in the supplement showing the actual conversion factors used for each type of compound.

6. Fig. 2: This figure is difficult to intepret. The text states that most species have higher concentrations during the daytime, but the way the lines are linked together in Fig. 2 make it look like the opposite is true. I would advise looking for a different way to represent this. Perhaps representing each mz with a marker instead of linking the lines, or even using a completely different type of plot to show this, for example grouping compounds and showing the ratios as box plots. What does it mean for the

particle phase to be measured in ppt here?

7. Line 302: Here, it could be worthwhile to add some more detail to discuss why biomass burning is high at night to give some more context to this observation. Is this typical in cities in China? Does this follow a similar pattern to those observed in different locations? What kind of burning is taking place and for what purposes?

8. Line 304: While it is perhaps obvious from context, it should be specified here that it is the diurnal cycle of C6H10O5I- that closely resembles the m60 fragment.

9. Fig. 4: This figure would benefit from a reminder in the caption of what the different compounds are.

10. Line 391: MVK and MACR need to be defined.

11. Line 416: 'Did not resemble well' – the meaning of this is unclear.

12. Fig. 10: In the text, the authors hypothesise that the low ClNO2 days are related to low chloride salt concentrations in the aerosol. Given this, it would be beneficial to show the AMS chloride concentrations in this figure alongside ClNO2, instead of in a separate figure in the supplement.

13. Fig. S17: It is not clear what message is being shared by including this figure. It would be helpful to elaborate in the figure caption or in the text.

14. Lines 536-9: This sentence is difficult to understand; consider revising.

15. Lines 556-7: Would these compounds not be fragmented in the AMS?

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-1187, 2020.