

Response to Editor's comment

Comments to the Author:

I feel that Reviewer #2 raises a valid point about this manuscript being a better fit for a "Measurement Report" as opposed to a "Research Article". For a research article, there will need to be specific research questions that are addressed by the measurements. I suggest the authors articulate their research questions at the end of the introduction (Lines 99-102). It would be great if the authors can better motivate the study, beyond just the lack of CIMS measurements in urban areas as the only reason. Are there specific research questions about atmospheric processing, emission sources, air quality impacts that these measurements can help address?

The same comment applies to the conclusions. Some guiding questions to consider: As the reviewer suggested, is there a central story that links all the different sets of observations? Or what is the most important observation among these different observations that has the greatest implication? What is unique about these measurements done in a densely populated urban area? I think that if the authors can strengthen the discussion here (and in conjunction with laying down some research questions in the introduction), this manuscript can be a good "Research Article".

Reply: We appreciate the editor's constructive suggestion. In our opinion, this manuscript should be a "research article" rather than a "measurement report" for three reasons. Firstly, through a comprehensive interpretation of mass spectra in both gas phase and particle phase from the FIGAERO-I-CIMS, we identified a number of important compounds that can be used for indicating OVOCs emissions and chemistry in the urban atmosphere. Secondly, this manuscript provides a detailed discussions of the experimental design, instrumentation setup, calibration and data processing of the FIGAERO-I-CIMS: e.g., (a) performing sensitivity calibrations in the laboratory using multiple methods for multiple species; (b) performing voltage scanning for determining sensitivities of unknown compounds; (c) performing humidity calibrations for multiple types of species, all of which was severely lacking after introduction of measuring OVOCs using Iodide CIMS by Lee et al. (2014). Last but not least, as there are very

limited studies reporting the measurements of oxygenated organic compounds in the urban air utilizing FIGAERO-CIMS, this work can serve as a valuable reference for the future field studies on urban air quality in other cities.

Our manuscript mainly focuses on the interpretation of mass spectra of the FIGAERO-I-CIMS measured in a densely populated urban area: (1) Sections are organized through the interpretation of the mass spectra. (2) In each section of a specific chemical type, we chose to discuss those species that had high concentrations during the campaign detected in the mass spectra. Our observations suggest that oxygenated organic compounds in urban environments are complicated in both sources and chemistry. Oxygenated organic compounds can be both emitted from various emission sources (e.g. vehicular emissions and biomass burning) and also secondary produced in the atmosphere. The chemistry in forming and removing these oxygenated organic compounds can be associated with daytime and nocturnal reactions initiated from both anthropogenic and biogenic precursors with strong influences from NO_x chemistry.

We have stressed the purpose and significance of our work in the revised manuscript:

(1) (Introduction, Line 92-98) **Meanwhile, a systematic analysis on mass spectra of FIGAERO-CIMS in the ambient air is imperative, for a more holistic view in investigating emissions and chemistry of oxygenated organic compounds using FIGAERO-CIMS. (...) We describe the experimental design, instrumentation setup, calibration and data processing for the FIGAERO-I-CIMS in the campaign.**

(2) (Summary, Line 613-618) **The experimental design and instrumentation setup were described in detail, which goes above and beyond typical studies, including (1) performing sensitivity calibrations in the laboratory using multiple methods for multiple species; (2) performing voltage scanning for unknown compounds detected in the ambient air; (3) performing humidity calibrations for multiple types of species, which we have not seen anyone do after Lee et al. (2014).**

(3) (Summary, Line 642-651) **Our observations suggest that oxygenated organic compounds in urban environments are complicated in both sources and chemistry. Oxygenated organic compounds can be both emitted from various emission sources (e.g. vehicular emissions and biomass burning) and also secondary produced in the atmosphere. The chemistry in forming and removing these oxygenated organic compounds can be associated with daytime and nocturnal reactions initiated from both anthropogenic and biogenic precursors with strong influences from NO_x chemistry. This work demonstrates that the rich information in both gas and particle phases provided by FIGAERO-I-CIMS can greatly promote the understanding of emission and chemistry of organic carbon in the atmosphere of urban regions.**

I also recommend examining the grammar/language more closely, particularly with the revised portions of the manuscript. Here are some that I picked up, but by no means exhaustive:

Reply: We thank the editor for the comment. We went through the manuscript and corrected the grammar error we found.

Line 57 “fully accounted for”

Reply: Corrected.

Line 71 “understanding”

Reply: Corrected.

Line 87 only MOVI should be included in the acronym, since that is the inlet

Reply: Corrected.

Line 112: I think “global” means worldwide, whereas the measure you report here is local.

Reply: “global solar radiation” means the sum of the diffuse and direct solar radiation, not the radiation on the total surface of the earth. We replace “global” with “total” to avoid confusion.

Line 113: that is a strange unit for solar radiation. Usually it is in W/m². MJ/m² might be integrated for a time period (e.g. a year?)

Reply: MJ/m² is the integrated solar radiation in fall.

Line 128-130: run on sentence (multiple “which was”)

Reply: The sentence is modified:

LWC of aerosol was taken as the sum of water contributed by inorganic components predicted by ISORROPIA II model and organic components calculated based on the organic hygroscopicity parameter (Fountoukis and Nenes, 2007; Guo et al., 2015).

Lines 258-259: “after humidity correction was applied”

Reply: Corrected.