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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Elemental ratio measurements of organic compounds using aerosol mass spectrometry: characterization, improved calibration, and implications" *by* M. R. Canagaratna et al.

Anonymous Referee #1

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This is an important paper that provides an authoritative development in the interpretation of data from the Aerodyne AMS. While the instrument has proved to be of much use to the atmospheric community in studying organic aerosols over the last 15 years, it has been confounded by issues surrounding fragmentation of organic molecules and interferences from other peaks in the mass spectrum. There have been a number of papers over the years refining the technique and this presents the most significant development since Aiken et al. (2008). By systematically studying authentic standards and SOA analogues using both the standard AMS configuration and the VUV version,

the authors find that key metrics, notably O:C and OM:OC, have most likely been underestimated in the past.

Overall, this is a very well written paper, dealing with the issues methodically and clearly. The biggest potential issue is that the paper is very close to being of too technical a nature and had it not dealt with implications to previous atmospheric studies, I would have recommended it as more suitable for AMT. However, there is probably just about enough atmospheric science in there for it to qualify, in my opinion. Other than that, my comments and suggestions are very minor and I have no hesitation recommending this be published in ACP subject to these.

General comments:

I cannot help feel that the main point of interest to the general AMS community will be the presentation of the new methods for estimating the key metrics (Improved-Ambient). However, the methodology is slightly more complex than the Aiken methods, so I feel that this should be described in more detail in the abstract and conclusions (specifically, that the method uses specific markers to try to predict the signals not correctly accounted for). In addition, this modification will necessitate a change to the algorithm used in the PIKA/APES software routinely used for this. In the interests of traceability, the authors should specifically refer to this software and state the version number that this applies to.

While this paper will no doubt prove to be an important milestone in the interpretation of AMS data, the results were previously alluded to in Daumit et al. (Faraday Discuss., 2013, 165, 181 doi: 10.1039/c3fd00045a). Given the prominence of this paper, the authors should comment on whether the parameterisations have changed in the intervening time between the works.

Specific comments:

P19797: Was the humidity after drying measured? Given silica gel's performance at

low relative humidities and the long equilibration times reported for some organics, can we be assured that the water was completely removed from the aerosols?

P19798, L24: The issue of objectively standardising the temperature is of much interest to the community because there is much anecdotal evidence that this is critically important. Therefore, I suggest that the authors provide more details on how this is performed in the supplement.

Regarding the effect described on Van Krevelen plots, it would be useful to give an example plot so the reader could get a visual idea of the magnitude of the effect.

Technical corrections:

The terms 'Aiken Explicit' and 'Aiken Ambient' are effectively introduced by this article, however they are referred to in the abstract as if they are established nomenclature. This should be revised for the sake of clarity.

The authors used the term 'oven' rather than 'vaporizer' on a couple of occasions.

P19794, L12: In the interests of being current, more recent references for aerosol impacts should be cited (e.g. the most recent IPCC report).

P19804, L19: The reference used for the 'default' frag tables is given as Allan et al. (2004) here and in table S3, however it is specified as Aiken et al. (2008) in table 2. This should be clarified.

The 'Hildebrandt Ruiz' reference is frequently referred to as 'Hildebrandt'. This should be made consistent.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 19791, 2014.