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Atmospheric Measurement Techniques Discussions

Interactive comment on "A technique for rapid source apportionment applied to ambient organic aerosol measurements from the Thermal desorption Aerosol Gas chromatograph (TAG)" *by* Yaping Zhang et al.

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*A revised document (with Track Changes enabled) has been provided to the editor.

Anonymous Referee #1

General comment: The paper is sound, well written and very well structured. It presents a novel method for a fast source apportionment (SA) of ambient particulate matter. This methos is less time consuming than methods based on individual organic molecules, and has some advantages over fully "bulk" methods (such as PMF run on AMS readings). However, the advantages are not clearly stated (e.g. in the abstract

and in the introduction). It would be very interesting to know about the authors' opinion on the advantages and disadvantages of this SA methodology. The paper presents an error estimation for the method, as well as a coparison with other SA proceures. The methodology presented in the paper also addresses technical limitations of GC/MS in a satisfactory way.

Author Response: The authors thank the reviewer for the comments and address further questions below. Regarding the advantages of TAG binning method over traditional integration method, we have previously stated in the abstract that it "the new binning method incorporates the entirety of the data set and requires significantly less pre-processing of the data than conventional single compound identification and integration." The following sentence regarding its advantage over AMS has been added to the abstract at page 1, line 29-31. "In addition, while a fraction of the most oxygenated aerosol does not elute through an underivatized TAG analysis, the TAG binning method does have the ability to achieve molecular level resolution on other bulk aerosol components commonly observed by the AMS."

Particular comments:

1) Abstract Introduction At the end of the first paragraph, a sentence talks about the past efforts made to apportion the major chemical components as well as to attribute sources. There have been many attempts and approaches to do so, relying not on individual components, but rather on bulk properties. However, the references cited are quite recent. Since this is a major goal of the present paper, this subject deserves a more in-depth reference.

Author Response: The following has been added to page 2, line 8-14.: "While inorganic ions, EC/OC, OC functional groups and trace metals from off-line filters analyses of atmospheric aerosol have been used for source apportionment (Chueinta et al. 2000; Ito et al. 2004; Lee et al. 1999; Ramadan et al. 2000; Ahlm et al. 2013), recently, high time resolution Aerodyne aerosol mass spectrometer (AMS) mass spectra and Aerosol

Chemical Speciation Monitor (ACSM) have been extensively used to determine the major components of ambient OA (Zhang et al., 2011; Ng et al. 2011). Online and offline measurements of molecular level marker molecules have also been used to apportion the major chemical components and source attributions of these organic aerosols (Schauer et al., 1996; Jaeckels et al. 2007; Zhang et al., 2014; Williams et al., 2010, 2014)."

2) page 2, lines 17-19: which are the aspects that the AMS cannot resolve and that the capacity to resolve single components of the TAG can? Please elaborate and cite relevant works.

Author Response: The following has been added to the page 2, line 26-33.: "The organic matter presenting similar mass spectra cannot be resolved by AMS. However, this type of material can be resolved by gas chromatography separation. For example, all alkanes show similar mass spectral patterns with dominant mass spectral peaks at m/z 43, 57, 71, 85, etc. AMS only can separate alkanes from other chemical classes with different functional groups, such as organic acids. AMS cannot separate different alkanes which are all grouped into one component called hydrocarbon-like organic aerosol (HOA) (Zhang et al., 2011), although various alkanes may come from different sources. However, TAG can resolve all alkanes through gas chromatography separation and preserve individual compound information to determine potential temporal variability differences (Williams et al., 2006, 2010)."

3) Methods Results and Discussion page 8, lines 23-24: reword "... described in detail in of Zhang ..." to "... described in detail in Zhang ..."

Author Response: changed in the revised manuscript

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