

## Response to reviews

Reviewer comments are in **bold**. Author responses are in plain text labeled with [R]. Line numbers in the responses correspond to those in the discussing paper. Modifications to the manuscript are in *italics*.

### Reviewer #1

**This is a nice paper which performed a comprehensive evaluation of the new CV-TOF-ACSM in urban environment, and provided important information on source spectra of primary emissions, mass quantifications of non-refractory species, and the uncertainties in PMF analysis of CV-ToF-ACSM. This paper is well written and I recommend it for publication after minor revisions.**

[R0] We thank the reviewer for the valuable feedback and constructive suggestions. Detailed responses are given below.

#### Comments on content:

**1. Can the authors give more information on the source experiments? For example, the relative number fractions of diesel trucks, heavy duty vehicles or gasoline vehicles during the tunnel sampling? For the coal and biomass burning experiments, what are the burning conditions, flaming or smoldering? The mass spectra can be quite different if the burning conditions are different.**

[R1] We have provided additional descriptions in the Sect. 2.1 as follows.

Line 84-85: “*a) the vehicle exhaust in the De Sheng Kou tunnel located on the G7 highway (40.289° N, 116.185° E) in Beijing*”.

Line 86: “*c) the flaming-phase exhaust from a common residential stove when burning three types of coals*”.

Line 88-90: *The on-road fleet measurements for vehicle exhaust were conducted during 11 PM to 12 AM when over 90% of the traffic fleet consisted of heavy-duty vehicles that were mainly diesel-fueled in the tunnel.*

Line 100: “*quartz filter samples were collected ... in a combustion chamber during flaming state*”.

**2. Any reason to exclude  $m/z$  12–20 for PMF analysis? Some important spectral information can be missed, e.g.,  $m/z$  15 ( $\text{CH}_3^+$ ) for biomass burning OA. Did the elemental analysis in Figure 4 include  $m/z$  12–20?**

[R2] Although the mass spectra in Fig. 4 were shown for  $m/z$  above 20 because of the space limit, ions with  $m/z$  12–20 were indeed included in all PMF analysis as well as in the elemental analysis. We have corrected the  $m/z$  range in Sect. 2.2 and have revised the captions of Figures 1, 2, 4 for clarification.

**3. The results showed considerable differences in apportionment of POA and SOA between CV-TOF-ACSM and HR-AMS. Do the authors have recommendations on how to report POA and SOA from CV-TOF-ACSM measurements in the future? This is critically important for modelers since CV-TOF-ACSM appears to report much higher SOA than traditional HR-AMS in polluted environment.**

[R3] We thank the reviewer for the suggestion. In Line 371-373, we have added our recommendation “*We recommend to add “CV-” as the prefix of the PMF factor names for future CV-based AMS, ACSM, or TOF-ACSM studies to differentiate them from the published results from traditional SV-based instruments.*”