

## ***Interactive comment on “Observations of Highly Oxidised Molecules and Particle Nucleation in the Atmosphere of Beijing” by James Brean et al.***

**Anonymous Referee #2**

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Access Review of the MS entitled “Observations of highly oxidised molecules and particle nucleation in the atmosphere of Beijing” by Brean et al.,

Authors’ have used state-of-the-art Chemical ionization atmospheric pressure interface-time of flight mass spectrometer (CI-API-TOF-MS) to characterize the HOMs as well as the particle size distributions using the Scanning mobility particle sizer (SMPS), other trace gases such as ozone and SO<sub>2</sub> using respective commercial on-line gas-line analyzers from the Urban Beijing environment. The manuscript is within the scope of the ACP. The topic discussed here is the “role of highly oxidized multifunctional organic molecules (HOMs) from polluted Beijing” is most relevant in the present day context of increase in human activities and associated emission of VOCs, their transformation in the atmosphere as these contribute to ambient particulate load

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and, thereby, can have considerable health-effects. All the discussions about the role of HOMs on particle growth followed by NPF events due sulfuric acid clusters in Urban Beijing are well supported by the observations. I recommend publication of the manuscript after revision. Some comments below could improve the readability of the manuscript.

L 26: VOC abbreviation in the abstract is not defined L28-31: sentence is hard to read L 58. Delete ‘the’ before ‘many’ L76: Add a “, the” after compound L77: Abbreviate BVOC here. Biogenic should compare with anthropogenic VOCs. So correct these statements. L87-88: Statement is not clear. L129: change “organics” to “organic compounds” L111: what is APHH here? L179: what is it stand for d’p and Nd’p here? L186: What is J(O’D)?? Please provide some baseline information here. L244-258: This text is not clear enough to understand the Figure 2. Some background information should be provided how to interpret the data and what is observed followed by what does it mean? L261: change ‘throw light upon’ with ‘reveal’ L263: peak in the daytime? But it looks from Figure 3 that mostly peaking in the evening/night time. Why there is no peak on 23-24/06/2017 L268: HOM components peaking in the daytime? From Figure 3, it is not clear. What is the basis for this assumption that HOMs are produced by the oxidation of anthropogenic/biogenic components (e.g., alkylbenzenes, monoterpenes, isoprene). Figure 3: C6 - C9 components, and summed C11 - C18 components, assumed to be dominated by alkylbenzenes and other larger components respectively-how this was assumed? L 284: Please add panels ‘a, b, and c’ in Figure 3 and accordingly refer these in the discussion in the manuscript here. L312: Relative to what?? L320: majority of peaks occurring the daytime? But from Figure 3, it is mostly in evening time. L336: Early afternoon peak? By looking at Figure 4, it looks like evening hrs. The scale showed ‘0:00 HRS’ – Is it 24:00 hr? L337-338: From where, it is inferred this (i.e., similar behaviour of C3-benzenes and their oxidation products as C2-benzenes and their HOMs)? L344: I could not find J(O’D) in Figure S1! L346-347: Figure S2 does not provide this information, please double check and maintain consistency between text and supplementary information. L350: This is inferred from which figure, please men-

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tion. L369: text is unclear-'what is unit mass data' L371-372: This normalization part is not clear enough to follow the figure 5. Please elaborate. L403-404: sentence is not clear. In Figure 3, point the two peak of HOMs on 25/06/2017 to understand the text described here. L405: I am not able to see the two peaks in C2-benzenes in Figure 4. Please encircle or write clearly to maintain consistency with figure. L407-9: These sentences are not clear. Please consider rephrasing these sentences L412: From Figure 5, PSM cluster peaked at 10:00 and 13:00 h have m/Q between 200-550 (as also stated on L409). But the specified m/Q here is beyond the scale shown in Figure 5. Is it correct or I am missing something. L412: Add 'because of' after 'presumably' L416-418: Please refer to the figure. L425: Define 'SA-DMA' here. L443: From the Figure 3, HOM peaked in the evening hours on 24/06/2017 compared to 25/06/2017, where HOM peaked at the early afternoon. So 'daytime peak of HOMs' need to be rephrased.

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