

My main concern is that the sample inlet (line 107) was a few meters from the exhaust vent. This suggests that the measurements will be mixed with ambient concentrations and also affected by wind speed and direction.

We acknowledge the impact of dilution effects. Lines 112-116 highlight the potential variability from ambient background air mixing. Field campaigns inherently face unpredictability compared to controlled lab settings. Despite these challenges, they reflect real-world conditions. We delve deeper into these effects in Section 4, "Conclusion and Atmospheric Relevance."

Another concern is the fact that the authors measured in background, on-road and cooking environments at different times of the day and analysed the differences between sites, also calculating  $\Delta$ concentrations ( $\Delta$ OA and  $\Delta$ BC) based on the background concentrations. Please, explain why you can do this analysis.

Using our mobile laboratory, we measured emissions from background, on-road, and cooking environments. While our initial plan didn't include assessing these diverse sites, driving the lab van to the cooking sample location inadvertently led us past the background site and several roads. This unintentional movement provided the opportunity to collect data from these extra sites.

Figure 1 graphically presents the differences in emission concentrations across these locations, highlighting the distinct characteristics of cooking emissions in contrast to the incidental background and road sites.

Specific comments.

Line 44. Depending on the location, biomass burning is also a main OA source.

We acknowledge biomass burning as a major source of Organic Aerosols (OA). Yet, our study specifically focuses on urban air pollution sources. We understand there might have been some ambiguity in our manuscript, leading to misconceptions.

To clarify, we've revised statements, notably in line 44, to emphasize our concentration on urban air quality in the United States.

Line 59. The authors mention PM<sub>2.5</sub> cooking has increase but the data used to make their point (line 56) states that their concentrations went from 2.4  $\mu\text{g}/\text{m}^3$  to 1.2  $\mu\text{g}/\text{m}^3$  between 1982 and 2010.

We have emphasized the increasing percentage of PM<sub>2.5</sub> attributed to cooking. This may seem contradictory given the overall decrease in PM<sub>2.5</sub> levels and reduced traffic emissions. However, it's

important to clarify that while the absolute amount of PM<sub>2.5</sub> from cooking has decreased, its relative contribution to the total PM<sub>2.5</sub> has increased when compared to studies from 1982 and 2010. In essence, over time, cooking's proportionate share of PM<sub>2.5</sub> has grown, even if its absolute contribution has lessened.

Line 164. Are you sure that the AMS spectra with nitrogen-containing compounds are from the cooking exhaust?

We adhered to methodologies endorsed by the AMS user group meeting to ensure the utmost precision in our data. To validate the presence of N-containing peaks in our mass spectrum, we examined the following steps:

First, one potential concern is that the formation of refractory components on the vaporizer surface can lead to conditioning that potentially affects the vaporizer interaction (Allan et al., 2003). However, after consultation with Aerodyne, it was confirmed that our signals were not due to surface ionization. Notably, peak shapes and peak widths of ions like Na<sup>+</sup> and K<sup>+</sup> were similar to Ar<sup>+</sup>, as seen in Figure S9. This similarity suggests consistent peak shapes without anomalies. If the signals from those metal elements show distinct lumpy or broad signals, it indicates that the ions are coming from the surface of the vaporizer and follow a different path to get extracted into the MS, leading to different peak shapes.

Second, Figure S8 demonstrates the peak fitting of N-containing fragments, providing their genuine existence. Further assurance comes from the absence of signals when the chopper was closed, ruling out internal instrumental errors.

After thorough checks, we can assertively confirm our data's accuracy and eliminate the possibility of instrumental anomalies influencing the observed nitrogen contributions.

#### *References:*

*Allan, J. D., Alfarra, M. R., Bower, K. N., Williams, P. I., Gallagher, M. W., Jimenez, J. L., ... & Worsnop, D. R. (2003). Quantitative sampling using an Aerodyne aerosol mass spectrometer 2. Measurements of fine particulate chemical composition in two UK cities. Journal of Geophysical Research: Atmospheres, 108(D3).*

Looking at the supplement, it seems that the sampling inlet is too low and perhaps too far from the cooking exhaust (figure S1.). The measurements performed by the instruments might be mixed with the ambient OA concentrations.

We maintained a consistent sampling inlet position across all sites using a single mobile laboratory. However, this consistency might lead to varied dilution rates with the background atmosphere at each site. Elements like restaurant vent placements and atmospheric conditions such as wind speed and direction can affect outcomes depending on the sampling day and location. This could result in a mix of ambient Organic Aerosols (OA) with delta OA and Black Carbon (BC) concentrations. Figure 1

adjusts for this by removing background pollutants from the initial data. We acknowledge the complexities introduced by these factors and have sought to thoroughly address them in our study.

Line 181. The sampling methodology should be moved to methods section.

The methods section of our paper provides an in-depth look at our sampling approach. The details pertaining to Figure 1 specifically shed light on the timing of our background, on-road, and cooking emissions measurements. Through a succinct summary of our method in this context, we strive to improve the reader's understanding of the figure in relation to our broader methodology.

Line 186. These variations in concentrations could also be related to the different times of the day that measurements were taken. i.e. from 3pm to 6pm.

Figure 1 reflects variations based on two main factors: sampling location and time. Notably, these dynamics only stabilized once we reached the restaurant emission source. For context, the sample from Bar/Restaurant 2 was taken on August 14, 2019, with sampling commencing at 6:20 pm and concluding at 7:04 pm. As depicted in Figure 1, as we neared the restaurant around 6:20 pm, concentrations of CO, CO<sub>2</sub>, Organics, Black Carbon, and Particulate number markedly rose. This spike isn't easily attributed to just time variations, as it's not a slow increase. It's a pronounced surge, likely due to closeness to the emission source.

Line 190. I would not just call it "likey" when you are measuring during the on-road sampling period, vehicles are the main pollution source.

In line 195, we've chosen to use "significantly" instead of "likely" to better emphasize vehicles as the predominant pollution source on roads.

Line 194. I'm not sure about the calculation of a  $\Delta$ OA and  $\Delta$ BC

To accurately assess air quality, background pollutant levels are typically subtracted to focus on specific source effects. This 'background' originates from natural events and distant or widespread human-made sources. Subtracting these levels accentuates the impact of the primary source under study. This method effectively isolates contributions from natural and distant sources, providing a more distinct view of the specific source's pollution impact. In our work, we derived  $\Delta$ OA and  $\Delta$ BC by subtracting background levels (based on the 5th percentile of daily data) from the measured OA or BC levels. This approach refines our insight by considering inherent and distant pollutant influences.

Line 216. This could also be related to a change in wind direction or wind speed.

We agree that numerous factors can affect spikes in OA concentrations. But when our mobile laboratory was proximate to restaurant emission sources, cooking emissions or other outputs from these establishments likely played the dominant role in these peaks. Although wind changes could cause mixing with the background atmosphere, potentially diluting OA levels, the notable surge in concentration is evident. As previously emphasized, this sharp rise isn't easily ascribed only to day-to-day fluctuations. The data reveals a distinct and immediate spike, pointing more towards the nearby emission source than to other external variables.

Line 235. The authors should explain why they are calculating the OA/BC or maybe at the end of this analysis to give an explanation about the meaning of these values.

In our study, the OA/BC ratio was instrumental in identifying the sources and trajectories of emissions. This ratio can vary based on factors like food type, cooking techniques, and chosen cooking oil or fat. Organic emissions mainly stem from the heating and pyrolysis of oils, fats, and food, while black carbon emissions predominantly come from burning biomass fuels and coal. Evaluating the OA/BC ratio sheds light on the balance between primary emissions and incomplete combustions, the latter signaled by black carbon levels. This ratio also highlights organic aerosol contributions specific to cooking. This comprehensive approach greatly enhances our understanding of the diverse emission sources.

Line 244. In order to mention that CO may come from food cooking rather than from fuel combustion the authors should know about the cooking practices and fuels. This is an important information.

Line 363. Those peaks are also related to combustion, for example the hydrocarbon OA factor from vehicle emissions. That is why it is important to know the fuel type used in the restaurants.

In our research, we drew informed assumptions from our observations and a thorough review of relevant literature. We observed that most restaurants we studied seemed to use typical stoves, neither electric nor wood-fired. However, given the inherent variables of real-world field studies compared to controlled lab experiments, we can't definitively specify the fuel type or combustion method each restaurant used, both of which profoundly affect emission compositions. Consequently, our methodology involved making inferences from observable factors during sampling and insights from prior studies.