Review of Katz et al.

General comments:

Katz et al uses long-standing flux measurements at a site in Berkely California and couples them with intermittent mobile laboratory measurements throughout the broader region to identify OVOCs (ethanol, methanol, acetaldehyde) that contributed heavily to the molar flux and OH reactivity flux. The combined methodologies cover broad spatial and temporal scales and evaluates the results with current emissions inventories. This is a well-written manuscript, though, I have a few questions regarding the source attributions, assumptions, uncertainties, and spatial scale mismatches with the emissions inventories that should be addressed before publications. Overall, this is an impressive dataset and analysis, though limited in scope by the footprint representativeness.

Specific comments:

Cooking ethanol:nonanal ratio: The derived cooking-specific ethanol:nonanal ratio was determined as 80 using a 10th percentile "lower edge" daytime flux fit. While this matches specific indoor stir-fry experiments (Arata et al., 2021: 75), it is more than double the regional, observationally constrained ratios of 37 utilized in recent Los Angeles chemical transport models (Zhu et al., 2025), which are based on LA airborne fluxes and integrated HOMEChem profiles (Arata et al., 2021: 40.2). It is also much higher than the values determined from PMF source apportionment that the GRAPES inventory was initially built upon (Coggon et al., 2024;11). These differences can really drive the conclusions of this work, significantly modifying the daytime ethanol flux attributed to cooking and the subsequent residual determinations of VCPs.

→Can you explain how these discrepant spatial scales reconcile (local high-density commercial tower footprint of 2.8 km^2 vs. integrated regional airborne flights).

→Can you demonstrate that the 10th percentile fit isolated pure cooking rather than co-located, temperature-independent VCP solvent or mobile emissions, maybe color the scatter plot in Figure S9 by the benzene:ethanol ratio.

→Can you provide a quantitative assessment showing how varying this ratio impacts the absolute molar flux distribution of ethanol.

→Can you confirm which specific ratio the GRA2PES inventory applies (i.e., is it PMF-based or scaled up using HOMEChem and flux measurements?).

Mobile and VCP tracers: It appears as though the total benzene flux is used as a mobile source scalar to establish an upper bound on vehicular ethanol emissions. However, the mobile data demonstrate that benzene co-emits with PCBTF and acetone, pointing to significant solvent/VCP sources of benzene in this urban footprint.

→Can you discuss how much urban solvent emissions inflate the local benzene flux and quantify how this might lead to a systematic overestimation of the 9% upper-bound on-road ethanol allocation.

→How much should we “trust” the GRAPES ethanol to benzene ratio for on-road sources and are there other studies that justify using this ratio for the mobile sector

Residual lumping to VCP+: VCPs are treated as a simple residual ("other") without explicit tracers, acting as a grab bag for everything from indoor-to-outdoor exchange to solvent evaporation. Because any uncertainty in the cooking ratio (80) or the vehicle fuel ratio (7.1) directly propagates to this residual…

→are there sector-specific tracers within VCPs that could further elucidate these sources?

→Can mobile sampling data be leveraged to isolate specific ethanol plumes and associate them or their ratios with co-emitted industrial, construction, or cleaning tracers? Essentially using mobile measurements to "constrain" mobile sources, specific VCP sources, etc. Similar to how fingerprints can be used to constrain PMF.

Biogenic emissions: It is assumed that biogenic emissions of ethanol, methanol, and acetaldehyde are negligible and can be ignored. However, biogenic inventories (MEGAN and BEIS) can systematically underestimate urban biogenic VOCs. Specifically urban biogenic emissions have been shown to be underestimated by MEGAN, do you have any localized tree coverage estimates within your footprint or can you justify whether assuming a strict zero contribution from biogenics is physically warranted. Can biogenics be integrated into the tracer methods for ethanol or methanol in any way? How does this vary in the surrounding regions?

Spatial scales and inventory evaluation: The flux footprint (2.8 km^2) is compared to a much coarser inventory grid resolution (3 grids at 4×4 km). Can you justify the selection of 3 grids and were they re-normalized to the footprint's area? Because the inventory distributes cooking emissions based on population density, please discuss how population density compares to actual restaurant density in the area. Can the authors downscale the inventory using restaurant density metrics to match the footprint, or scale up the flux measurements to match the grid?

Methanol:ethanol: Methanol flux correlates strongly with ethanol flux, which is attributed to VCPs and indoor-to-outdoor exchange. While this holds at a monthly scale, does this correlation persist at the high-frequency 30-minute or diurnal scale? Showing this high-frequency correlation is necessary to prove whether these compounds share immediate emission sources or if the correlation is merely a seasonal artifact of temperature and boundary layer dynamics.

Grouping Saturday with weekdays (Monday–Friday) masks key differences, as commercial construction and industrial solvent use typically drop significantly on Saturdays compared to mid-week. What do you see when you separate Monday–Friday, Saturday, and Sunday in the acetone diurnal flux analysis.

If cooking occurs year-round and restaurant density is constant, why does the daytime ethanol flux decrease by nearly 50% in winter? Is this more driven by temperature-dependent indoor-to-outdoor exchange (e.g., closed windows suppressing ventilation transport) or physical deposition effects. I'd imagine the levels of cooking stay the same through all seasons.

<u>Minor Comments/Technical Corrections:</u>

Report the exact instrument operational parameters (specifically E/N and FIMR voltages) and the stability of the calibration factors across different periods in the SI

L118 Monoterpenoids are summed at the parent and major fragment mass, how is fragment overlap from monoterpenoids and monoterpene alcohols (such as eucalyptol, which fragments to m/z 137) accounted for?

L119 Define what specific criteria are used to classify compounds as "well-behaved."

Can you explain further the physical or mathematical justification for choosing a 8 second window to determine co-emitted VOC spikes.

L166 Please clarify the phrase "default calibration factor scaled by the fraction of parent ion detected." Does this refer to a calculated *k*-rate calibration factor adjusted for instrument-specific fragmentation?

Are there any other known interferences at the propanol dehydration product ($C3H7+$) given its low molecular weight?

Were any corrections applied to acetaldehyde for ethanol and ethylene glycol interferences?

L275 Tower ethanol fluxes in Berkeley were higher than those in Beijing. Given differences in cooking styles and oil usage, is this physically expected, or is it an artifact of Beijing's measurements representing a much broader regional scale?

Why was nonanal not quantified in the mobile laboratory?

Show a diurnal profile comparing raw mixing ratios to fluxes to contrast nighttime boundary layer accumulation against active daytime venting (especially for nonanal and ethanol).

In Figure 6(a), shouldn't the measured ethanol flux be reached since VCP+ represents the full residual?

Why not include nonanal spike co-occurrences in Figure 9?