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Comment on acp-2021-948

Anonymous Referee #2

Referee comment on "Seasonal characteristics of atmospheric peroxyacetyl nitrate (PAN) in a coastal city of Southeast China: Explanatory factors and photochemical effects" by Taotao Liu et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-948-RC2, 2022

The paper entitled "Seasonal characteristics of atmospheric peroxyacetyl nitrate (PAN) 1 in a coastal city 2 of Southeast China: Explanatory factors and photochemical effects" is generally well written, interesting and within the scope of ACP. However, the authors need to address a few minor comments, before the paper is suitable to be published in ACP.

Major comments:

I find the description of the VOC measurements a bit brief. Which classes of VOCs did the authors monitor with their GC and using which columns? It is not clear whether aldehydes and ketones were measured and if so which ones. Figure S5 doesn't discuss OVOCs as ozone precursors. While table S2 includes some OVOCs, it doesn't mention some important compounds like acetaldehyde, MVK, methylglyoxal and methacrolein. Where these compounds measured and if yes how? It appears to me that the authors are assuming that these are primarily secondary compounds that are derived from other primary emissions ethane, propene, isoprene and aromatics (line 57). If they are just model calculated and not measured then this could bias the results. While these compounds, no doubt have photochemical sources, there can also be substantial primary emissions particularly from various types of biomass burning (Pallavi et al. https://doi.org/10.5194/acp-19-15467-2019), industrial sources and, in the case of acetaldehyde also vegetation (Sarkar et al. 2017 https://doi.org/10.5194/acp-17-8129-2017)

The authors should include a more detailed description of their measurements different VOC classes and if some VOCs where only calculated as secondary products in the observation-based model (OBM) then this should be mentioned and the corresponding uncertainties should be discussed. If they were directly measure, it would be better to include OVOCS in the analysis of Figure 6.

Minor comments:

Line 28: I could not quite understand what the authors intend to say in the following sentence "Without considering the transformation of peroxyacetyl radical (PA) and PAN, acetaldehyde contributed to the dominant production of PA (46±4%), followed by methylglyoxal (28±3%) and radical cycling (19±3%)."

Line 30: Gramar needs to be improved, Maybe the following will convey the intended meaning better: "The PAN formation was highly VOC-sensitive, as surplus NOx (compared with VOCs abundance) prevented NOx from being the limiting factor photochemical formation of secondary pollution."

Line 32: This sounds like a generic statement "PAN could promote or inhibit O3 formation under high or low ROx levels, respectively.". It may be more appropriate to target this at the results of the present study "At our site, PAN promoted and inhibited O3 formation under high and low ROx levels, respectively."

Line 36: The authors could be a bit more assertive and specific in highlighting the contribution of their study to the scientific understanding. "Might be helpful" doesn't sound very convincing to me and doesn't specify the main contribution.

Line 52: Gramar: "is the only formation pathway" instead of "is solely formation pathway"

Line 72 Language: "were the most significant contributors" instead of "offered the highest contribution"

Line 74: "Recently, negative and positive impacts of PAN photochemistry on O3 production were captured under the low and high NOx conditions, respectively." This statement should include a reference to the corresponding study.

Line 99: "was attributed to the downwind region of the downtown (Xiamen island) with densely population " can be simplified to "was downwind of the densely populated downtown region (Xiamen island)"

Line 100 in my opinion field observation should be plural “field observations were” not singular

Line 122 I have never come across the term “ultrasonic atmospherium” before. I believe the correct name would be "weather station with 2D sonic anemometer".

Line 209 please avoid colloquial language “The wind directions in late spring and early autumn were messy due to the season switch.” More scientific “During the transition from spring to summer the wind direction fluctuated between … and … while during the transition from summer to autumn the wind direction fluctuated from … to …”

Line 210, respectively missing at the end of the sentence “The wind rose charts showed that the wind direction frequencies with relatively high wind speed in spring and autumn were southeast wind and northeast wind (Fig. S2), respectively.” Also define “high” by inserting a number “(>… m/s)” in brackets.

In general, the manuscript should be run through a grammar check software before resubmission. It is better to avoid colloquial language and indirect phrases. It is OK to be direct and use simple sentences.