

## ***Interactive comment on “Non Methane Hydrocarbons variability in Athens during winter-time: The role of traffic and heating” by Anastasia Panopoulou et al.***

### **Anonymous Referee #1**

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#### General comments:

The article presents a very nice data set of a range of VOCs from the Central Athens area during a five month measurement period. The data will be of use to the wider community for general interest as well as for comparison with datasets from other Cities. There article features some simple plots presenting the data in an informative way and the authors draw some conclusions about sources of VOCs and reasoning behind the seasonal changes observed. I do feel, however, that there is insufficient evidence presented here to support the authors' claim that the boundary layer height change between October and December is not the main cause of the observed increase in

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VOC mixing ratios. I would suggest the authors either re-phrase the sections relating to this (to include the possibility of meteorology playing a major role) or provide more evidence in support of this. Despite this I would suggest that there is sufficient material here and am in favour of publication of this article.

Technical comments/corrections: (Note the numbers listed here indicate page number followed by line number (eg. 2, 11 indicates page 2, line 11)).

Throughout the article: “C2-C6”

Should be written as C2 – C6

2, 11: “Athens, the capital of Greece and an important megacity, . . .”

Is Athens a megacity? Generally a megacity is considered as one with a population of more than 10 million. Further justification is required or this should be removed.

2, 27: Comment “The above demonstrate the increasing need for intensive measurement of NMHCs in Athens, to better understand their sources, temporal characteristics and role on smog formation, in the new conditions established during the economic crisis years, with competing traffic and wood burning.” Perhaps more fundamentally there is need to observe the current atmospheric composition to allow for the impact of future changes (fuel composition changes or other control strategies) to be assessed. There is a need to establish a “current baseline” for Athens.

3, 24: “The trap was then heated rapidly to 22 °C. . .”

Is this a typo? Compounds won’t desorb well (if at all) at these temperatures. Should this read 220 °C?

3, 28: “The overall estimated uncertainty of the measurement is 15%.”

A more detailed discussion of the measurement uncertainty is required to understand how this value is derived. Which parameters are included within the uncertainty? Does the uncertainty vary with compound type? Is it dependent upon mixing ratio or con-

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stant across the measurement range? These are all important details which should be included here.

4, 28: “. . .with the exception of isoprene (approximately 10%).”

Why was the data coverage for isoprene worse than others? Were there interferences? This is important to inform other potential users of this equipment for the measurement of VOCs and also needed to confirm that the data quality of the other VOC measurements wasn't impacted by these issues.

5, 1: “. . . the significant night time levels (above 300 ppt in some cases). . .”

Can this data be trusted given the aforementioned problems with the isoprene data coverage? Further discussion may be needed (unless this is covered in the explanations of the isoprene data coverage above).

5, 5: “. . . while lower values were below 5 ppb for the whole period.”

I'm unsure what this statement means, clarification is needed. Does this relate to ethane and ethylene or the other VOCs measured?

5, 8: “The average concentration of benzene during the studied period was 0.7 ppb (still not a full year), which is considerably below the EU average annual limit of 5  $\mu\text{g m}^{-3}$  or 1.5 ppb (Directive 2008/50/EC of the European Parliament).”

The data presented here doesn't include summer time values where we'd expect lower mixing ratios. If these were included then presumably the value would fall well below the threshold. This should be included here, it is of interest in- and of- itself, but also leads the reader to question whether the current directives are suitable and adequate?

5, 12: “The comparison with those already published for the GAA, indicates an apparent decrease by a factor of 2 to 6 for the majority of the species lying above C4 (taking as reference the case of Ancient agora urban area in the close vicinity of the Thissio Station), always bearing in mind differences in sampling period (summer versus win-

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ter), location, sampling method and analytical techniques.”

Is it possible to estimate of the actual decrease? This would be of interest here, despite the various caveats that must be included.

5, 20: “Furthermore, our findings for benzene and toluene, were significantly lower than the 12 hour day-time average levels reported for a Cairo rural background area, as reported by Khoder et al., 2007 (mean levels of 5.8 and 7.5 ppb respectively).”

I don't see the significance of this statement? It needs expanding to make its relevance clear.

5, 23: “. . . pattern for all NMHC concentrations was their gradually increase from October. . .”

Typo gradually to gradual

5, 29: “. . . according to Kokkalis (personal communication) the winter-time decrease of PBL is in the range of 20%,. . .”

This is an important statement in the context of this article and needs more detailed supporting evidence. Later figures and text attempt to reaffirm this statement to support the implication that source-changes define the changes in VOC composition. In its current format I don't see a convincing argument to support this. Either the authors need to include substantial supporting evidence for this or the text should be altered to include the possibility that the variations in VOC mixing ratios could be due to changes in Meteorology.

6, 7: “Although the amplitude of both peaks is almost similar (with the exception of December), the duration of the night peak is at least a factor of 2 larger, indicating the predominant role of heating in air quality during wintertime.”

This would also be conducive with boundary layer dynamics dictating the night time profile.

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6, 25: "... the most frequent, resulting to moderate levels of NMHCs."

Typo "to" to "in"

7, 2: "... 2 to 3 times higher levels of NMHCs were observed on December. ..."

Typo "on" to "in"

7, 7: "When NMHCs are examined against temperature (not shown here), a clear tendency is not evident, although the highest levels occur at lower temperatures."

A plot of this would be useful to be included here.

7, 21: "More precise picture. ..."

Typo "More" to "A more"

8, 15: "The most striking difference is related to the night and early morning peak, while during mid-day the difference is Minimum."

This requires more detail. While the concentration rise is smaller at mid-day, the relative rise looks to be more or less the same for the early morning and mid-day periods (approximately double). Including the percentage increase would clarify this.

8, 16: "...while during mid-day the difference is minimum. ..."

Typo "minimum" to "minimal"

8, 18: "For the nSP cases (Fig. 7 and S7) the concentrations of all compounds were very low (lower than the minimum of the SP periods) and almost equal, with the exception of ethane and acetylene that demonstrated higher concentrations in December by a factor of two (Fig. S7a,e)."

I can't make sense of this sentence, it needs re-writing/re-phrasing for clarity

8, 32: "It is interesting to note that the profiles, especially those derived from the morning peak, nicely fit with that reported for traffic by Baudic et al. (2016) in Paris (when

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only the common NMHCs measured in this work have been used).”

I don't see a “nice fit” they look different in magnitude and relative composition. Please provide more detail of what the authors are implying by this.

9, 2: “. . . butanes are however be noted in the morning peak. . .”

Typo “be” needs to be removed

9, 4: “Toluene, an important contributor to the traffic profile (Fig. 8), was measured only for one month during winter.”

Does this affect the plot? Is that why the toluene is lower than at other sites? This sentence needs expanding upon to clarify its effect, if any, upon the figure.

9, 12: “. . .(the contribution of the later was more evident during winter).”

Typo “latter” not “later”

Fig 7 caption: I suggest including the definition of SP and nSP within the figure caption

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-936>, 2017.

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