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Interactive comment on “The impact of monoaromatic hydrocarbons on OH reactivity in the North Sea boundary layer and free troposphere” by R. T. Lidster et al.

Anonymous Referee #2

Received and published: 24 January 2014

This paper presents airborne and ground-based measurements of a number of hydrocarbons using traditional GC-FID measurement techniques as well as GC x GC TOF MS. The ability to measure an extended suite of aromatics such as monoaromatic hydrocarbons using the GC x GC TOF MS was used to determine the impact of these more rarely measured compounds on OH reactivity, in order to quantify the extent to which they may explain the overestimates of measured total OH reactivity compared to the sum of known sinks.

Overall this is a very nice paper. The writing is clear and the arguments are logical. My comments are mostly minor and relate to use of significant figures and improving the

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clarity of the manuscript.

Specific comments:

A general comment is that the introduction seems much more about the measurement technique than the application to monoterpenes in the North Sea. Make sure the introduction is aligned with the title of the paper.

Page 32427 Line 11: Mention of analysis on the rural edge of London is surprising here, given the title's emphasis on the North Sea.

Page 32427 Line 17: Composition of what?

Page 32427 Line 20: Give the reader a general sense of where the East Midlands Airport is. Identify it in Figure 8. Also change Figure 8 to Figure 1 since it's the first Figure to be discussed. Axis labeling on Figure 8 is too small to read.

Page 32428 Line 8: What is the sampling duration and frequency? Though the canisters are coated inside, what are the canisters themselves made of? Are "canister" and "bottle" being used interchangeably? Suggest just using one term.

Page 32428 Line 18: Describe what sensitivity tests you have done to ensure minimal losses.

Page 32428 Line 26: What carrier gas was used? Helium?

Page 32430 Line 18: What is meant by "as frequently as possible"? How many times per flight? Is this statement applying more to the ozone and terpene standards than the AR54 hydrocarbon standard (which seems to be run 4-8 times a flight)?

Page 32432 Line 20: The number of samples needs to be clarified. Earlier it seemed like there were 64 WAS bottles in 5 flights, for a total of about 320. The number here (191) is much smaller.

Page 32432 Line 22: Suggest 'actual' instead of 'real' (all air samples are real).

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Page 32432 Line 22: Name the seven compounds (benzene, toluene, heptane, octane ... what else?)

Page 32434 Line 17: The use of 'J' is initially confusing because in atmospheric chemistry J is associated with photodissociation rate constants.

Page 32434 Line 13: "For the correlation plots presented in Fig. 5, the intercept in each was set to zero." This doesn't always seem to be the case. There are also some plots showing negative concentrations.

Page 32435 Line 19: Include the standard errors of the slope here as well as in the Figure.

Page 32435 Lines 24-26: Avoid using 'significant' twice in this sentence.

Page 32435 Line 25-26: Add error bars to these averages and adjust the number of significant figures accordingly.

Page 32436 Line 7: What is meant by "differential plume sampling"?

Page 32437 Line 10: Quantify 'significant portion'.

Page 32438 Line 10: Here and elsewhere avoid over-using 'significant'. It is difficult to know how significant a 1.9 s-1 difference is without knowing the absolute values. Background values are low but urban values can be quite high.

Page 32439 Lines 16, 18: 'Significant' is used too frequently.

Page 32440 Lines 12-14: "Quantification of many of the species detected within this study was not possible owing to a lack of appropriate standards and unknown stability within the WAS canisters." This sentence needs to be clarified. What species are you referring to? It seems to contradict Page 32428 Line 18 on the minimal losses in the WAS canisters.

Page 32440 Lines 12, 19: The statements about lack of standards are confusing be-

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cause other groups measure many compounds discussed in this paper and so standards are indeed available. Specify what species or classes of compounds you mean by 'many of the species'.

Figure 2: The figure is important but the font size is almost impossible to read. Also red lettering against a blue background is difficult to read. In box 'C' 1-8 can't be distinguished from one another; does this improve if this corner of the chromatogram is enlarged?

Figure 5 and Table 3: Table 3 could be omitted since this information is presented in Figure 5. In Figure 5, adjust the significant figures on the slope and SE of the slope so that they match. For example in panel 'd' change 0.0349 ± 0.0007044 to 0.0349 ± 0.0007 . Also here and elsewhere there are too many significant figures in the R² values that are listed.

Figure 5a, e: What does a negative concentration mean? What limitation is this showing?

Figure 6: Same comment as in Figure 5. Use the SE to determine how many significant figures to present. For example 7.299 ± 0.1549 should be changed to 7.30 ± 0.15 . Standard errors of 8.948×10^{-16} are not meaningful.

Figure 7: There are too many significant figures in the cited percentages. To aid in clarity make the legend order the same as the pie chart order. Also explain the left hand versus right hand pie chart in each panel; the red average isn't included in the legend though the blue total toluene is.

Table 2: Please double-check and adjust the number of significant figures according to what the precision allows. For example a maximum value of 65.19 pptv for styrene is too precise.

Minor comments:

Grammatical errors: While the paper is very nicely written there are numerous small

grammatical issues on many pages throughout the manuscript (capitalization, punctuation, grammar, etc.). Please proof the manuscript carefully. Note that 'data' is plural. Here are examples from page 32425: on line 12 use a period rather than comma; on line 17 add punctuation.

Page 32424 Line 25: Define '[OH]'.

Page 32426 Line 9: No need to cite Philips and Liu twice.

Page 32427 Lines 4, 19, 23: Reconcile the different acronyms (BAE-, BAe-, BAe). Define FAAM on line 4 not line 19.

Page 32427 Line 5: Define the RONOCO acronym here not on line 16.

Page 32428 Lines 1-3: For each compound give both its name and formula.

Page 32428 Line 15: Define 'PC' (need to define each acronym).

Page 32430 Line 12: No need to hyphenate parts per billion; also ppbv is parts per billion by volume.

Page 32437 Lines 9-11: Order the references.

Page 32439 Lines 1-8: Verb tense changes from past to present.

Figures 1-6, 8-10: The font size in each figure is too small.

Figure 5 and other Figures: Label each panel.

Table 1: All abbreviations (RT, Quant, RSD, etc.) need to be defined. 'Figure ref' needs to be clarified (it seems like a range at first).

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