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Interactive comment on “Characterization of non-methane hydrocarbons in Asian summer monsoon outflow observed by the CARIBIC aircraft” by A. K. Baker et al.

Anonymous Referee #2

Received and published: 15 September 2010

General comments

This study reports of enhanced C₂–C₈ non-methane hydrocarbons (NMHCs) observations in the summer monsoon outflow in the upper troposphere over Southeast Asia. The paper is clearly written and the level of English is good. The in-situ measurements presented here are an important contribution to the relatively scarce number of in-situ data currently available for Southeast Asian troposphere. The NMHCs data themselves are thoroughly analyzed and support the conclusions well.

I have a few recommendations for improvement of the paper that I would like to see addressed in the final revised version. Firstly, this study lacks the inclusion of observa-

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tions of the biomass burning tracers methyl chloride ((CH_3Cl) from the flasks samples) and acetonitrile ((CH_3CN) from the PTRMS instrument onboard the CARIBIC aircraft) to support the analysis and strengthen the conclusions. Secondly, the presented data could be compared in more detail to results from similar studies to put them in perspective. Thirdly, the potentially important role of enhanced NMHCs in ozone formation in the UT is only briefly mentioned in the conclusion and deserves more attention in the discussion, notably in a separate paragraph.

Hence, I recommend publication of this article in ACP after revision based on my comments as described in more detail below.

Specific Comments

1. Biofuel burning is one of the major sources of anthropogenic pollution in Southeast Asia, as clearly pointed out in the paper. Hence, whenever possible, observations of NMHCs should be supported by observations of the biomass burning tracers CH_3Cl and CH_3CN . The CARABIC instrument package includes these observations (see e.g. Lai et al., ACP, 2010) so the authors should use these data in their analysis when they are available or give a valid explanation why they do or cannot use these data in the present study (e.g. due to a mal-functioning instrument).
2. The authors refer to NMHCs enhancements during summer relative to spring and fall. Similar to the comment of referee #1 I believe that it would be very useful to compare the absolute data of this study with measurement data from neighboring areas. How important are these enhancements in absolute sense as compared to comparable studies? I would suggest comparing the data of this study in any case with those in the recently published CARABIC paper by Lai et al. focusing on South China and the Philippines.
3. The potential role of enhancement NMHCs as precursors for ozone formation is mentioned in the conclusions as one of the chief concerns of monsoon outflow without having addressed this topic in further detail earlier in the paper. The authors should try

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to address this phenomenon in more detail in the Results and Discussion, e.g. using the ozone data as well as the $\delta\text{O}_3/\delta\text{CO}$ ratios from the same flights and comparing these with results from other studies that focus on Asian outflow (e.g. like in Lai et al., 2010).

Technical comments

Abstract, line: replace "...that included the non-methane hydrocarbons." by "...that included a number of C₂-C₈ non-methane hydrocarbons."

p. 18103, line 16: "... and lower stratosphere." please add a reference here.

p. 18107, line 14-15: "... mixture of NMHCs purchased from the National Physical Laboratory (NPL, United Kingdom)." Please add a sentence on the accuracy of your standards here.

p. 18109, paragraph 3.1, comments on the first sentence on the role of OH. Note that this is mainly true for mid- and high-latitude and to a lesser extend for the (sub)-tropical regions were seasonal variations are more transport driven.

p. 18116, line 23, the authors use an estimated [OH] value of 2.4810×10^6 molec cm^{-3} . This is an model estimated value and should not be presented with four digits. Write 2.48×10^6 molec cm^{-3} and try to give an uncertainty here.

p. 18117, line 22, also here try to give an uncertainty value to the estimated [OH] of 1.44×10^6 molec cm^{-3} .

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 10, 18101, 2010.

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