

Interactive comment on “PTR-MS measurements of non-methane volatile organic compounds during an intensive field campaign at the summit of Mount Tai, China, in June 2006” by S. Inomata et al.

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We thank valuable comments and suggestions from the anonymous referee 2. Responses to the comments and suggestions are given below. We reflected these responses in a revision of the manuscript.

Specific comments

1. We agreed with the referee and we revised the abstract according to the comment.
2. (a) We have referred to the paper of Barletta et al. (2005) in Introduction, and
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add a sentence “However, the precursor concentrations in the model simulations have not been validated well through observations because there is limited knowledge on NMVOCs in the CEC region.” to the end of 3rd paragraph in Introduction.

(b) We have replaced “continuously measured” with “performed on-line measurements of”. Overviews of the MTX2006 campaign will be described by Akimoto et al. (in preparation).

3. We have referred to Gao et al. (2005), which describes the environment of the sampling site in detail.

4. We were only able to bring a seven-VOC premixed standard gas to the observation site in China to check the stability of detection sensitivities. We mentioned it at the end of P26702. Calibrations including humidity dependence were performed for eleven VOCs (listed in Table 1) in the laboratory, as mentioned at Sec. 2.3.

For other species, the mixing ratios were calculated by eqn. (1). The detection limits were 0.01–0.08 ppbv for a typical 10-s integration time, as mentioned at the end of P26704.

5. The GC-FID measurement/analysis was conducted by the co-authors of Tokyo Metropolitan University (TMU) group, whereas the PTR-MS measurements/analysis was carried out by the group of National Institute for Environmental Studies. The contents of the present paper focus on NMVOC data obtained by PTR-MS and hence some NMHCs data by GC-FID were used for comparison. The GC-FID/GC-MS data obtained by TMU have been published as an independent paper in Suthawaree et al. (2010), which we refer to in the present paper.

6. de Gouw et al. (2003a) showed good agreement between PTR-MS- derived and GC-MS-derived concentrations for a variety of VOCs including methanol, acetonitrile, acetaldehyde, acetone, isoprene, MVK+MACR, MEK, benzene, toluene, C₈-aromatics, C₉-aromatics, and monoterpenes. We expected that such agreement would be ob-

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tained before intercomparison. However, we found significant discrepancy for toluene and isoprene and little correlation for monoterpenes as all the referees pointed out. We think that the number of samples for the intercomparison was not enough due to limited availability of canisters for the GC-FID. We are now building on-site GC-FID/MS system by which ambient air is directly analyzed, and will be able to compare GC-FID/MS with PTR-MS data as de Gouw et al. (2003a). As pointed out by the referee #3, we will try to use the catalytic converter described by de Gouw et al. (2003a, 2003b) to take background signals in ambient air.

7. Since we have no experimental data with regard to naphthalene and methyl-substituted naphthalenes, we have removed the sentences “The peaks at m/z 129, 143, and 157 were...C₈-C₁₀ aldehydes/ketones in the study.”

8. We have revised sentences as “There is little correlation between Σ monoterpenes and M137 (Fig. 2(e)). The data of Σ monoterpenes (M137) will not be discussed in the following sections.” Therefore, we have deleted the data of Σ monoterpenes (M137) in Fig. 3(d).

9. (1) We wanted to show in Fig. 3 that the diurnal variations mainly depend on local photochemistry in the absence of regional influences. During 24-28 June, prominent diurnal variations, with a daytime maximum and night time minimum, were observed every day for formaldehyde (Inomata et al., 2008), NO_z, and wind speed. Therefore, we chose this period to explore diurnal variations for other VOCs. We mentioned this at the 1st paragraph of Sec. 3.3.

(2) We agreed with the referee. We have revised the text.

10. (1) We have revised the title following the referee’s comment.

(2) According to the referee’s comment, we have added a table (Table 4, new table number) summarizing the PTR-MS-derived concentrations and statistics for some calibrated NMVOCs. We did not tabulate the calculation-derived NMVOC data by eqn. (1),

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because the uncertainty is substantially large.

(3) We agreed with the referee's comment and we have revised sentences as "Suthawaree et al. (2010) suggested from the enhancement ratios of benzene and toluene to acetylene by GC-FID that the observation site was greatly affected by emissions from stationary sources rather than vehicular emissions".

11. As mentioned in text, overall mean concentrations of NMHCs (~ 6 ppbv), including the NMHCs that cannot be measured by PTR-MS, were determined by GC-FID. Overall mean concentrations of OVOCs (~ 30 ppbv) were determined by PTR-MS. Thus, we concluded that OVOCs are the predominant NMVOCs.

12. We have inserted the reference "Inomata et al. (2008)" in text.

13. We have removed the sentence "Model simulation showed that the episode was related to open burning of biomass (crop residues)" and inserted the sentences "The high concentrations likely stem from significant open biomass burning of crop residues as discussed elsewhere (Li et al., 2008; Suthawaree et al., 2010; Yamaji et al., 2009). After harvest, crop residue is either directly returned to agriculture fields as fertilizer, burned in the field, or used as biofuel (Yamaji et al., 2009). The observation site was located in the fire spot cluster spreading over 800 km (longitude) \times 400 km (latitude) during the first half of the campaign, displayed by Suthawaree et al. (2010)." in text.

14. The Δ NMVOCs/ Δ CO ratios in the present study in Table 2 were obtained from the data during the episode of high NMVOCs concentrations (8:00 CST on 12 June to 12:00 CST on 13 June). We think that the air masses during the episode were fresh because the contribution of the secondary photochemical production was not significant. Therefore, the present data can be compared with the referenced numbers.

We investigated the emission ratios for other NMHCs such as aromatics. We found substantial enhancement in the emission ratios for the NMVOCs listed in Table 2 in the BB plume but not for other NMHCs

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15. We have revised the abstract and the sentence in Sec. 3.5 according to the referee's comment.

16. We have revised the sentence as "which suggests that the photochemical production of OVOCs or the emission ratios were higher at the summit of Mount Tai than in the urban area (Boston/New York) of the United States east coast."

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