

Interactive comment on “Characterization of volatile organic compounds (VOCs) in Asian and North American pollution plumes during INTEX-B: identification of specific Chinese air mass tracers” by B. Barletta et al.

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The authors would like to thank the reviewer for taking the time to read our manuscript and for the valuable comments. The manuscript was revised to reflect the reviewer's suggestions, and the detailed list of changes is presented here.

GENERAL COMMENTS

The revised manuscript now includes an additional section on Principal Component Analysis (section 3.5). We agree with the reviewer that the use of this statistical tech-

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nique strengthens the overall discussion by providing an additional tool to evaluate the main sources affecting the VOC levels both in the whole INTEX-B data set and in the specific pollution plumes.

The verbs in the manuscript have been revised and the past tense was used.

To clarify the location of INTEX-A data, a figure showing the flight tracks was added (Figure 1-a), together with a brief description of the geographical location of the INTEX-A flight tracks (“The INTEX-A data were collected predominantly over the USA, Eastern Pacific and Western Atlantic between latitudes of 27-52°N (Figure 1-a)” – second paragraph of the Introduction). In the revised manuscript we decided not to use the INTEX-A background as reported in literature by Liang et al. To be consistent with the background calculated for INTEX-B, and to have a more comprehensive list of background values, we calculated instead the INTEX-A background from the whole INTEX-A data set as the average of the lowest quartile of the data – stratospherically influenced air excluded. This increases rigor to the comparison between INTEX-B and INTEX-A background.

Figure 4 of the original manuscript has been removed and the INTEX-A background data are now listed in Table 3 together with the pollution plume data and the INTEX-B background data. The t-test the Reviewer originally asked was not included in the revised manuscript because of the revised calculation of the INTEX-A background data and the increased number of trace gases included. However, we always kept in mind the variability associated with each average value during the comparison. Finally, we did not split the tables to have one with the background data only because in the revised manuscript many sections were expanded and more tables included. Therefore, we tried to keep the number of tables to a minimum.

We have enhanced the discussion in many places, in particular related to Figures 1, 2, 4, 6 and Tables 2 (new table) and 4. In an effort to contain the length of the paper, Figure 8 of the original manuscript was removed, but the table containing the mixing

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ratios of the individual Chinese pollution plumes was kept following the suggestion of Reviewer #3.

Following the reviewer's comment we placed increased emphasis on the continued usage of halogenated compounds. In particular, we expanded the Halon-1211 section to better present how the INTEX-B data were used to evaluate the role of Halon-1211 as a tracer of Chinese air masses. We also expanded the discussion of Table 3 pointing out the elevated levels of halogenated solvents found in selected pollution plumes.

SPECIFIC COMMENTS

Figure 1 now has a lighter color for the bulk of the data. Thank you for this suggestion.

Figure 2. The colors were changed to make them more easily distinguishable, and a Figure was added to illustrate the INTEX-A flight tracks (Figure 1-a)

p. 7754, line 11. The magnitude of the variability observed for selected VOCs with respect to the average mixing ratio is now reported (first paragraph of section 3.1).

p. 7754, line 14. The authors agree with the reviewer that combustion is the only known source of ethyne. To eliminate any possible confusion, the sentence "Ethyne is a good tracer of general combustion" was changed in "Ethyne is a tracer of general combustion"

p. 7755, lines 1-5 and line 29. The discussion of the ethyne/CO ratio was expanded in response to reviewers #1 and #2. In particular, the time estimated from the back trajectories is now compared to the time frame inferred from ethyne/CO ratio and a more comprehensive discussion on the factors affecting the ethyne/CO and how this ratio was useful in our data analysis was added. The Figure 4 caption (Figure 3 in the original manuscript) now specifically indicates that the "INTEX-B" samples were "non-plume data". The sentence containing the "expected general trend" passage is now re-worded differently (third paragraph of section 3.1) and now reads: "In general however the C₂H₂/CO ratio captured the data set's broad features, namely the lowest value for

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stratospherically influenced air (0.5 pptv/ppbv), an intermediate value for samples with no pollution plumes (1.6 pptv/ppbv), and highest ratios for the pollution plumes(1.8-3.5 pptv/ppbv)."

P. 7756, lines 16-24. We didn't present this paragraph correctly, and therefore its meaning was misunderstood. What we wanted to compare were the mixing ratios of the Asian plumes encountered during INTEX-A with the levels measured in Asian plumes during in INTEX-B. Asian plumes were measured both during INTEX-A and INTEX-B, and during both missions the Asian outflow was sampled mostly over the American continent making the comparison of Asian plumes particularly interesting (as oppose to the Asian outflow sampled during TRACE-P when samples were collected very close to the source regions - i.e. over the western Pacific region). To avoid any possible confusion, this paragraph has been slightly re-worded, we added additional information on the geographical location of the Asian plumes encountered during INTEX-A, and now reads: "Five major Asian plumes, extending from the northeastern Pacific to northwestern Atlantic, were previously measured over North America during INTEX-A (see Liang et al., 2007 for their specific location). For many VOCs, the mixing ratios measured in the INTEX-A Asian plumes were considerably lower than those measured in the INTEX-B Asian plumes (i.e. Chinese plumes and Asian plumes)." (second paragraph of section 3.2).

p. 7756, line 26. In the revised manuscript we have now calculated the INTEX-B background using the average of the lowest quartile of the whole data set excluding the stratospheric intrusion. The 25th percentile yielded a reasonable background without limiting too much the number of samples available. (Third paragraph of section 3.2 of revised manuscript)

p.7757, lines 14-17. These sentences have been re-worded and placed at the end of the second paragraph of section 3.2. The sentence now reads: "We recognize that other factors can affect the levels of trace gases in troposphere, for example source and sink strengths, the predominant meteorology, and the geographical location of the

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air masses (i.e. latitude).”

p. 7757, lines 24-26. The sentence has been re-worded. It now reads: “The elevated mixing ratios of all of these species (with the exception of CH₃Br and CH₃I, which have strong biogenic sources) highlight the anthropogenic influence within these air masses.”

p. 7757, lines 6-7. This specific paragraph has been eliminated from the revised paper because of the general rearrangement of the manuscript. We did not use the reference suggested by the reviewer only because CH₃CCl₃ levels were not reported in this manuscript (they were not measured by our research group for INTEX-B).

The number of samples is now reported in Table 3 (previously named Table 2). Table 1 already listed the number of samples for each group.

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