

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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Received and published: 5 May 2009

The Authors present an analysis of extensive VOC measurements made during the INTEX B mission and from this identify chemical features associated with plumes of differing geographic origin over the Pacific. The data in itself is intrinsically interesting and worthy of publication since the number of free tropospheric observations that are made here routinely are very small, and the scientific community relies on infrequent intensive efforts such as INTEX to dipstick test the current state of the atmosphere. A result of this is the potential for unintended over-interpretation of limited data, and

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some cases of this need to be addressed in this manuscript to make it suitable for publication.

The identification of plumes over the Pacific is not a new phenomenon although accurately attributing them to specific sources is far from straightforward. Further detail in the paper is needed on how geographic sources were assigned to specific plumes. For example was there a minimum height above surface that trajectories had to follow or a minimum time spent within the boundary layer. Was this attribution done automatically (e.g. interception of grid box) or by eye? Were trajectories calculated for the time point of the centre of the whole air sample? P7754 needs more detail. . What would be very convincing would be the inclusion of a second classification methodology to show that there was no bias in plume attribution introduced through the trajectory method used. I note the other reviewer has suggested PCA. Can I muddy the water further by suggesting that cluster analysis may also be of use. The use of the latter technique could then generate probability distribution functions for individual VOCs in clusters from which, if all things are consistent, the three major trajectory source types of China, Asia and US would be identified. There is an intriguing comment on P7754 that not all high concentrations events are captured by the trajectory method. Is there a reasonable explanation for this, for example possible regions of convection not simulated by the trajectories?

A further question related to trajectories is the degree of significance that can be drawn out from the spread of C₂H₂ / CO ratios for the five Chinese plumes. Is this explained by differing ages of air mass as identified from trajectory or VOC clocks or is it indicative of a spread in the source emission ratios?

A great strength of the INTEX missions is the ability to directly compare Pacific with North Atlantic atmospheric composition. I wonder whether the analysis of the relative background composition values should be done with a lower percentile cut off however. There is actually something of an opportunity here, in that to get a reasonable ‘background’ for the N Atlantic tropospheric values the lowest quartile, and perhaps

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lowest 10%-tile need to be used since the N Atlantic free troposphere is basically one big plume. If the background values obtained here for the Pacific are more or less the same using a 50%, 25% or 10% cut off, it perhaps tells us something useful about the differences between the two regions.

A significant area for the paper to address is the section on Halon-1211. The thrust of the section is that 1211 continues to have enhanced sources from China, making it a marker for plumes from this region. Some unpublished surface data is included to support this hypothesis. If we start with the data in Table 2 however this doesn't appear to be borne out – there is little statistical difference between US, Asia or China plumes. Digging deeper it is clear that one plume does have an elevation and this is discussed. However Figure 6 shows the raw data, and in this there are also a few substantially elevated 1211 values in the US plumes, which do not get equivalent treatment. I'm struck therefore that this is a potentially contentious conclusion to draw from perhaps 4-5 canisters.

Some minor comments: Is figure 8 really needed? Can something other than a recent self-citation be used line 8 P 7760?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7747, 2009.