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Interactive comment on "Regional differences in organic composition of submicron and single particles during INTEX-B 2006" *by* D. A. Day et al.

Anonymous Referee #2

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This manuscript aims to advance our scant understanding of the sources, transport, and chemical evolution of the organic fraction of aerosol particles over the eastern North Pacific. Multiple analytical techniques are applied to filters collected from the NSF C-130 during 12 flights over the western US and adjacent Pacific during the second phase of INTEX-B. While it is safe to say that much more needs to be known about the composition and sources of organic material in aerosol throughout the troposphere nearly no sampling has been conducted in remote oceanic regions. I fully agree with one of the primary conclusions of this manuscript, i.e., many "more temporally and geographically extensive observations will be necessary to quantify the average concentrations of OM in the free troposphere over the Northeast Pacific". It is also implicit that, even after the present study, our knowledge of the composition and sources of that OM are rudimentary.

Given the importance of the topic, I was frustrated by the meager new results that are presented here. Relatively few samples were collected (just 72 filters over 12 flights for FTIR and XRF analyses, and only 113 individual particle from 10 samples for STXM-NEXAFS), and then a surprisingly small fraction of these samples yielded reliable results (only 17 FTIR spectra allowed quantitation of 2-3 functional groups out of the 8 target groups; while only 47 of the 72 samples were analyzed by XRF most of them provided data on the concentration of at least one element, but only 10 had concentrations high enough to quantify 10 or more elements). As a result, it is my opinion that one of the conclusions that could/should be drawn from this study is that the combination of sampling and analysis protocols adopted herein are not really suitable for airborne sampling in the remote troposphere. Clearly, using very small filters resulted in small sampling flow rates that limited the mass of particles collected in each sampling interval.

It is obvious that the authors realized they would be fighting detection limits in advance, and used the longest sampling intervals possible (duration of each level leg). While this did create some samples with "above detection limit" data, it also meant that most of these samples inevitably included multiple air masses from different source regions. And, analysis of the sparse data set revealed no clear new insights into spatial distribution, or predominant sources, of the OM in aerosol over the study region (e.g., "OM concentrations showed greater variability within air mass categories as compared to averages among them").

Given the small size of the data set, it is far from clear that dividing it into smaller subsets is appropriate. For example, is it realistic to suggest that as few as 2 samples can really represent any of the defined geographic regions? Similarly, applying "clustering analysis" to 17 FTIR spectra in order to define 5 clusters seems a bit ambitious. In this case it is stated that just two of the clusters included "more than half of all samples", implying that the other three clusters had to split < 8 samples between them. The rationale for using this statistical approach seems to be that it has previously been used for

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much larger data sets, since it is noted that the two dominant clusters identified in this work were "similar to three cluster averages identified by Liu et al. (2009)..." Perhaps this is encouraging, but what is meant by aligning two clusters in one study with three from another one, and more to the point, were Liu et al. able to draw any insight about sources/processing, etc, for their clusters? A similarly broad brush approach is used to examine the small data set on elemental tracers.

In summary, I feel that the title of this manuscript promises much more than is delivered. The data are unfortunately just too few to allow much progress on the ambitious and important objectives of the study.

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