

# ***Interactive comment on “Investigating the sources and atmospheric processing of fine particles from Asia and the Northwestern United States measured during INTExB” by R. E. Peltier et al.***

## **Anonymous Referee #1**

Received and published: 12 December 2007

### **General Comments:**

This paper provides a good overview of measurements taken during the INTEx-B campaign, and contains important contributions to the understanding of intercontinental transport of the primary components of fine particulate matter, organic carbon and sulfates. In general, the paper is clear and well-written, especially Section 2 (Methods). Occasionally, more precise language could be used to remind the reader of what is being discussed; specific instances where this would be helpful have been outlined in the Specific Comments section below.

The careful use of statistical analysis in investigating differences in Asian and North

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American plumes over the Northwestern U.S. is a strength of this paper, as is the discussion of the benefits and shortcomings of the specific statistical methods that were used. The results of the single and multivariate linear regression were generally not interpreted beyond their means (i.e. correlation was not confused with causation), but were still very useful in determining relationships that might highlight differences in atmospheric processing of SOA versus sulfate aerosol during long-range transport. One place where a more robust analysis is probably warranted is in the actual determination of differences between the North American and Asian plumes in Section 3.1. The authors compare median concentrations in plumes from the two continents and say that they are different, but they do not take into account differences in sample size and variance when making this claim. A non-parametric test could be used to show that the observed differences between plumes of Asian and North American origin during INTEX-B were indeed statistically significant.

### **Specific Comments:**

Page 17430, Line 12: Be sure to note that this is only true for the air masses of primarily Asian origin.

Page 17431, Line 6: Use e.g. in this citation. This is not an exhaustive list.

Page 17432, Line 10-11: Clarify what this means. Did GEOS-Chem predict correct maximum and minimum concentrations, but in the wrong location?

Page 17432, Line 26-27: The phrase "Studies focused on WSOC can also reduce the complexity of the carbonaceous aerosol" doesn't make sense. Is this referring to chemical complexity? If so, then this is something that no amount of studying will change. Or is it referring to the seeming complexity of the aerosol due to lack of understanding?

Page 17441, Line 20: Maybe mention here that you will support this claim with satellite data in Section 3.4.

Page 17444, Line 7: Can you speculate on why there is such a low minimum WSOC/sulfate ratio at 2 km altitude in the Northwestern U.S. profile in Fig. 3? Was this the boundary layer height?

Page 17444, Line 20: Could you comment here on the limitations of your assumption of cloud-free conditions for SOA and sulfate formation in the previous paragraph, given that conditions during trans-Pacific transport were often cloudy?

Page 17445, Line 7: Is this because lower-volatility organics have already been lost to particle formation?

Page 17446, Line 16: Be sure to clarify that "each flight" only refers to the two mentioned in the previous paragraph.

Page 17446, Line 17: What you have called the correlation coefficient here is actually the square of the correlation coefficient ( $r^2$ ), otherwise known as the coefficient of determination. It is good to be precise when using these terms, because, although both contain information about the strength of the correlation, only the correlation coefficient,  $r$ , contains information about the sign of the relationship. If you did not also include the scatter plots in Fig. 6 or the regression coefficients of those scatter plots in later sentences, the reader would not know whether there was a negative or positive relationship between WSOC and CO or water vapor from the  $r^2$  values alone.

Page 17447, Line 1: Section 3.4.3 doesn't exist. Looks like it should be a reference to Section 3.5.3?

Page 17447, Line 9: The phrase "In order to further identify WSOC sources" is probably stretching it a bit... so far the analysis has only identified relationships between WSOC and different variables.

Page 17448, Line 25: Here (and elsewhere in this section) "coefficients" are referred to, with no clarification as to what kind of coefficients these are. It would be good to remind the reader that the discussion is still focused on the  $\beta$ -coefficients from the multivariate

linear regression.

Page 17449, Line 5-7: Good! Although your analysis has provided much insight on relationships, it is wise to not over-interpret the results.

Page 17450, Line 23: Be sure to remind readers that "North American air masses" only refers to those that impact the Western U.S. Throughout this section, there are places where "Asian" and "North American" plumes are referred to in general; it would be good to remind the reader that these are still restricted to ones sampled during INTEX-B.

Page 17450, Line 24-25: This sentence is too vague. Be more specific by saying something like "variability in acetonitrile contributed little to WSOC variability" rather than "acetonitrile contributed no significant influence".

Page 17451, Line 19: Refer to Table 4 here so the reader remembers that the coefficient in the first set of parentheses ( $0.97 \pm 0.13$ ) is referring to the coefficient for methanol.

Page 17452, Line 7: The phrase "during this plume" doesn't really make sense. Perhaps change to "in the vicinity of this plume" or something similar.

Page 17453, Line 2: The INTEX-B campaign isn't mentioned anywhere in the conclusions. Maybe reference it in this first sentence.

Page 17453, Line 16: Remind the reader what the "particular altitude ranges" were.

Page 17453, Line 23-24: This sentence doesn't really describe an exception to the previous sentence, because these plumes represented less-aged air masses compared to the Asian ones. Make sure to clarify that.

Page 17454, Line 6: The phrase "meteorological transformations" could be more specific here, since your previous conclusions focused on cloud processing and scavenging by precipitation.

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Page 17454, Line 10-12: This sentence doesn't make sense. The data, not the air masses themselves, were further refined, followed by a comparison of the cases left in the newly-restricted dataset.

Page 17454, Line 13: Change "by multivariate regression analysis" to something like "multivariate regression analysis revealed that both biogenic..." The sentence currently doesn't make sense as is.

### Technical corrections:

Page 17430, Line 7: change *was* to *were* (subject-verb agreement)

Page 17430, Line 19: change *were* to *was* (subject-verb agreement)

Page 17431, Line 7: delete 306 after 1999

Page 17431, Line 13: *ASIA* should not be in all capital letters

Page 17432, Line 7: *ASIA* should not be in all capital letters

Page 17433, Line 26-27: there are two sets of references here, combine?

Page 17435, Line 22: change *this* to *the*

Page 17436, Line 12: *take off* should be one word or hyphenated

Page 17438, Line 11: comma should be a semicolon

Page 17440, Line 5: *it* should be changed to a plural pronoun (to agree with subject)

Page 17441, Line 26: capitalize first letter in *western*

Page 17442, Line 2 and 3: *ASIA* should not be in all capital letters

Page 17442, Line 8: *Trace* should be in all capital letters

Page 17442, Line 16: need comma before *at altitudes*

Page 17442, Line 20: delete extra *s* before  $sm^{-3}$

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Page 17442, Line 24: change *is* to *was*

Page 17443, Line 12: change *was* to *were*(subject-verb agreement)

Page 17443, Line 15: hyphenate *WSOC sulfate*

Page 17443, Line 20: need comma before *relative*

Page 17443, Line 22: capitalize first letter in *northeast*

Page 17443, Line 26 and 28: *ASIA* should not be in all capital letters

Page 17444, Line 1: capitalize first letter in *northwestern*

Page 17444, Line 6: *ASIA* should not be in all capital letters

Page 17445, Line 4: capitalize first letter in *northwestern*

Page 17446, Line 14: capitalize first letters in *central valley*

Page 17446, Line 15: capitalize first letter in *aqua*

Page 17446, Line 17: need a period after 0.52

Page 17446, Line 20: change *are* to *were*

Page 17446, Line 29: capitalize first letter in *northern*

Page 17447, Line 22: change *on* to *of*

Page 17449, Line 3: change *includes* to *include* (subject-verb agreement)

Page 17449, Line 11: need comma before *as of yet*

Page 17449, Line 18-19: the sentence beginning with *For example* is a fragment

Page 17450, Line 2: change *is* to *are* (subject-verb agreement)

Page 17450, Line 20: delete comma after *include*

Page 17450, Line 28: capitalize first letter in *northwestern*

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Page 17451, Line 2: capitalize first letter in *northwestern*

Page 17451, Line 23: capitalize first letter in *northern*

Page 17451, Line 4: capitalize first letters in *central valley*

Page 17452, Line 6: change *that* to *than*

Page 17452, Line 10: insert *the* before *Central Valley*

Page 17453, Line 2: capitalize first letter in *spring*

Page 17453, Line 3: change *attitude* to *altitude*

Page 17453, Line 3: insert *the* before *Western*

Page 17454, Line 5: *can not* should be one word

Page 17467, Table 4:  $R^2$  should either be less than one, or expressed as a percentage

Page 17468, Table 5 caption: first letter of *northern* should be capitalized

Page 17468, Table 5:  $R^2$  should either be less than one, or expressed as a percentage

Page 17471, Figure 3 ACE-Asia data label: *ASIA* should not be in all capital letters

Page 17472, Figure 4, 4th text box from the left: *tran*port should be *transport*

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17429, 2007.

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