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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Trans-Pacific dust events observed at Whistler, British Columbia during INTEX-B" *by* I. G. McKendry et al.

Anonymous Referee #3

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This paper characterizes two long range dust transport observed during INTEX-B experiment. Results of simulated dust emissions over East Asia, transport pathways of dust plumes, back-trajectory analysis, vertical profiles (aircraft measurement, LIDAR) and in-situ measurements (SMPS, OPC and chemical analysis) are used to describe two dust events in April and May 2006. Comparisons with other documented trans-pacific dust events are made. Despite the large amount of measuring techniques available, a clear description of the dust events is not yet achieved.

Abstract

p. 10276, lines 8-10: is there a correlation between the dust event and the enhancement of organic material ?

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Interactive Discussion

Discussion Paper

Introduction

p. 10277 lines 25-28: reference ?

p. 10278, line 19: I have the impression that WCB is not further used.

Method, p.10279-10280

The instrumentation used at Whistler is well described. However, several other used methods are not mentioned. Lidar measurement, elemental calcium and sulfate aerosol concentration at Crater lake Oregon are not mentioned. Crater lake Oregon is not situated on Figure 1. To ensure a better comprehension of all the results, a brief description of how is performed the simulated dust emission over Asia (Figure 3, it is actually partially described in p. 10281)) as well as how is calculated the transport pathway of dust plumes (Figure 4) would be necessary. OPC is mentioned, but no results from OPC are not explicitely mentioned.

Results

p.10280, lines 18-19: Figure 2 shows SMPS results. It is obvious that large diameter particles (1-3 m) are detected, but it is not yet a proof that these particles are dust particles. Five such events are detected, the two last ones having clearly an increase of large and fine particles. Please explain and comment.

p. 10281, line 2-7: Figure 2 shows an enhancement of super micrometer particles also during the 17th of May (and perhaps further on). Why did the authors consider only the 15-16 May for the second event? I do not see the shift to a particle size distribution dominated by fine particles, since an enhancement of fine particles is already measured on the 15 May. Why are the other events not described since the authors want to contribute to the 'emerging catalog of events'?

p. 10281, line18-20: Significant emissions are also produced on the 24-25 April, why did they not reach the Canada coast? The author seems to have enough tools (back-trajectories and transport pathway analysis) to answer this question.

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p. 10281, lines 24 -28: The way to simulate transport across the Pacific Ocean is not precisely enough described. For example, the reader does not know if back-trajectories or forward-trajectories are used, so that the link with Figure 8 cannot be understood. Are not Figure 4 and 8 describing similarly the dust transport (Figure 4 giving however more information) ?

p. 10282 line 2: in the introduction, the dust transport is qualified as “relatively rapid”. How long are the usual traveling time to cross the pacific ocean ? Comparison with previously described dust event will be interesting.

p. 10282 line 11: please give reference for the extension of BL to 3 km in the late afternoon.

p. 10282, lines 10-14 and lines 16-20: none of the information about the aerosol chemical composition involves mineral compounds. Are these compounds not measured? How can we then be sure that the described event are really related to dust events?

p. 10282, lines 14-16: The number concentration of small particles is probably always higher in the BL than above 3 km. How is this a particular sign of dust transport form Asia?

p. 10282 line20: the fact that fine particles above 3 km are greater than fine particles of the BL is due to longer lived aerosol and is not characteristic of dust events.

p. 10282 line 22: Figure 7 appears before figure 6.

p. 10283 line 1-4: without a comparison with standard ozone profile and values, the reader cannot estimate if the given ozone concentrations are an evidence of photochemical production of ozone. Ozone is not represented in Figure 5.

p. 10283 line 4-8: is this increase in sulfate and ozone visible for both dust event from April and Mai ?

p. 10283, lines 14-18: for reader not familiar with lidar measurements, neither the text

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nor the figure caption allow to understand what is measured and why it confirms the presence of an aerosol layer. Why are lidar results not described for the 16 and 17 May as well as for the April dust event ?

p. 10284 line 2: does figure 8 bring much more information than figure 4b?

p. 10284 line 3: figure 7 does not show any long range trajectory !

p. 10284 lines 6-11: It has been published by Sun et al. that the organic plume can be attributed to regional source. Is it therefore only a succession of dust and organic events? The large particles (2-3 micrometer) detected by SMPS (figure 2) during the 16-17 May are still mineral dust or organic aerosol? What is the link between the dust event and the organic plume?

p.10284, lines 16: Cater lake, Mt Hood and Oregon are not on figure 1.

p. 10284 lines25-28: The mean yearly or monthly (April and May) Ca and sulfate concentrations measured at Whistler have to be given, so that the reader can estimate the enhancement of both element during the dust events. The values for only the dust event are not sufficients.

p. 10285 lines 3-7: what are the criteria to qualify dust event as large ? How are the mentioned concentrations calculated (Ca, super-micrometer aerosol)?

p.10285, line 8: Comparing the dust events listed in Table 1 with Figure 9, it is not possible to know the required criteria to determine the occurrence of a dust event. For example, the Ca concentration in January 2000 and in April/May 2002 is much higher than during documented dust events (table 1). On the contrary no Ca data are available for the dust event of April 2001. The utility of Figure 9 is therefore questionable.

p. 10285 lines 14-15: Does sulfate concentration sometimes also reach the values of 1.8 gm-3 without the occurrence of dust event?

p. 10286 lines 14-17: Please explain why the different trajectories can explain the

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different chemical composition of the aerosol during dust event. The trajectories explain the organic plume after the dust event, but not the difference in sulfate concentration.

Figure 1: All the mentioned sites are not reported in the figure. If the number of figures has to be reduced, Figure 1 can probably be dropped.

Figure 3: the dates are not given in the same way as in figure 2. The colors between the squares (red and blue) in the top panel and the lines (green and blue) in the bottom panel are not the same.

Figure 5: title of the graphes are not similarly given.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 10275, 2008.