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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Intercontinental transport of pollution and dust aerosols: implications for regional air quality" *by* Mian Chin et al.

Anonymous Referee #1

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This paper describes the long-range transport of aerosol particles from pollution and natural sources and the contributions of these sources to surface fine particulate concentrations at both regional and global scales. Fine particular matter has significant implications for health, and therefore study of its transport is valuable for improving understanding of its environmental impacts, and is a necessary precursor to any attempt to control its concentrations. This paper provides a clear composition and source attribution of fine particulate matter over different parts of the US, including assessment of model performance against surface observations, and a wider assessment of the effects of intercontinental transport. The study is competent and interesting, the results are valuable, and the paper is worthy of publication in ACP.

The paper is well written, clearly organized, and appropriately illustrated. My principal reservation is that it is not clear which elements of the study are genuinely new and original and which echo the findings of previous studies. Previous studies are suitably acknowledged, but the paper would be stronger if the novel results were clearly highlighted. I believe that this should be relatively easy to address, and that the manuscript will then be suitable for publication in ACP once the following minor comments have been addressed.

General Comments

The paper is heavily weighted towards the US in its focus, but this is not reflected in the title. While it is clear that there are better measurement data to compare against over the US, little attempt has been made to extend the study to other regions. If the main focus is on surface air quality over the US (as is stated on page 9025, l.2), then it would be more appropriate to alter the title to "... implications for US regional air quality".

The paper would be improved if the new contributions of this study were more clearly highlighted. Earlier studies from Park et al. [2004] and Koch et al. [2007] are referenced (although more recent papers such as Hadley et al. [JGR, 2007] have been missed) but it is not clear where the present study adds substantial new insight. Is the paper merely supporting the conclusions of these studies, or is it adding significant new results? I believe that a number of the conclusions are original, and these need to be brought out more strongly at the end of the discussion in sections 4 and 5 and again in the conclusions.

Specific Comments

p.9016, l.3-7: East Asia is immediately upwind of the US, and this plays a large part in the recent interest.

p.9021: l,13: It would be worth noting the successful simulation of the April dust event (also shown in Fig 2) at both sites in the western US in Fig 4.

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p.9021-9024: The contribution and source attributions shown in Figures 6 and 7 are interesting, but the arguments would be strengthened if the authors also showed the seasonal variation of the total observed RCFM (a monthly mean of all stations in each sector).

p.9025: Do the results here confirm or contradict the conclusions of Koch et al [2007] that Arctic BC is dominated by Asian sources rather than US or European sources? Transport to the Arctic is of particular interest at the present time (due to IPY), and any further insight into transport to this region would be valuable.

p.9030, l.10: This is an important conclusion, and the implications should be stated clearly here (they are currently buried at the end of the fourth paragraph.)

p.9031, last paragraph: How sensitive are the results described here to the treatment of dust lifting processes or to the model wind speeds? How robust are these conclusions?

p.9032, l.8-16: This paragraph does not appear to add anything new to the conclusions, and should be cut.

Table 3: What are the annual mean RCFM from the observations? It would be very useful to add one row to the table showing the mean RCFM over all stations in each domain.

Fig 3: It would be helpful to highlight the four sites shown in Figs 4 and 5 with a different symbol.

Fig 6: The caption should state that the data shown here are from the model.

Typos

p.9013: 'Parck' -> 'Park' p.9022, l.2: 'agrees' -> 'agree' p.9023, l.14: 'is' -> 'are' p.9029, l.10: 'detecting' -> 'detection' p.9029, l.1a: add 'the' before 'North Pacific' p.9033: '2pp2' ? p.9035, l.2: 'Jeffe' -> 'Jaffe'

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