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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range transport of Asian dust and air pollutants to Taiwan: observed evidence and model simulation" *by* C.-Y. Lin et al.

Anonymous Referee #1

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General Comments This paper reports case-study results of long-range transport of Asian dust and air pollution to Taiwan. The paper includes a couple of interesting facts related to dust and air pollution transport to the sub-tropical region. However, this paper shows only a simple case study and the structure of paper is not well organized. The overall quality of this paper is fair and the authors must cite additional works to categorize the transport pathway and meteorological conditions for coupling and de-coupling cases of dust and air pollutants to Taiwan based on the specific comments given below.

Specific Comments

1. Page 10184 lines 11: Are the dust and pollutant air masses really transported

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separately? Judging from the observation results described in this paper, the peak concentration times differ, but are they already mixed when they arrive to Taiwan?

2. Page 10184 lines 18: Which is more important: transport paths or atmospheric boundary conditions?

3. Page 10185 Second paragraph: The authors mention that the results by Prospero et al. and Uno et al. are always mixed, but in this paper's case, they are de-coupled. This statement might lead to a misunderstanding. What is most important is the transport path and location of the receptor (such as Midway)? A more detailed description is necessary for the case in which they are de-coupled and/or mixed.

4. Page 10186 lines 22: What is inconsistent?

5. Page 10188 lines 11: Is NAQPMS used in a nesting grid structure? If not, please mention it.

6. Page 10188 lines 18 Equation (1) What are W and R? C1 must be a grid-size dependent parameter, what is the unit?

7. Page 10189 Section 4 This section has only Section 4.1. Do you need another subsection? If not, remove the line of 'Section 4.1' designation and include your text into Section 4 instead.

8. Page 10190 lines 13-29: The authors reported that the peak concentration time difference between dust and air-pollution is approximately 3 h. How do you explain this time lag? Based on the location of main sources of dust and air-pollutants, can you explain this difference? Readers will require more quantitative analysis of this lag.

9. Figure 5 may not be necessary. See comments in 16 below.

10. Figure 6: This figure shows the high backscatter for the air-pollution component, but for the dust component, the backscatter is small (depolarization is also small). Does this mean that the level of dust is less than that of the air pollution?

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11. Page 10193 Second paragraph: Figure 10: I can read that the peak times of SLUF and HNO3 are different. Why? From my perspective, from Figs. 9 and 10, the peak concentration times for dust and air-pollutants are separated, but are they already mixed when they arrive in Taiwan?

12. Page 10194 First paragraph: The description is very poor. Why is the emission inventory by Streets et al. an underestimation? Readers will need reasons explained here, supported by appropriate references.

13. Page 10194 Second paragraph: (a) Based on the trajectory analysis shown in Fig. 3, Beijing is not located upstream of Taiwan. Therefore. Fig. 12 (Lidar result of Beijing) might not be necessary for the main thrust of this paper (see comments in 16 below for figure restructuring). (b) Insert the location of Miyakojima into Fig. 3. (c) It might be wrong to assert that Miyakojima is not upstream of Taiwan. In this case study, both Miyakojima and Taiwan might be located on the same front line of the pollutant outbreak. If so, add the trajectory from Miyakojima in Fig 3. (d) Figure 11 and Fig. 6: The polarization level of dust in Miyakojima and Taiwan shows a difference of almost two times. Why? Does this arise from a difference of the measurement technique? (e) Figure 13: Again, the Beijing Lidar result is not essential in this paper.

14. Page 10195 Last paragraph: The authors have mentioned that this study is an exceptional case of dust and air pollutant transport to Taiwan. To identify the transport pathway and meteorological conditions for coupling and de-coupling of dust and air pollutants to Taiwan, I recommend the inclusion of additional analysis or review here.

15. Page 10196 line 25-26: Streets emission part = same as comment #12.

16. The overall flow of this paper is not well organized because of the many similar figures (some of which are unimportant). I suggest major restructuring of figures and discussion using only necessary figures: Figure 2 is unclear. Redraw it to clarify its main points. Into Fig. 3, insert the location of Miyakojima and the back-trajectory from there. Remove Fig. 5. The location of inversion is explainable by the text. Merge the

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information in Figs. 7, 9 and 11 into Fig. 6 as (c), (d) and (e) Remove Fig. 10 (If necessary, add a SULF concentration contour using dashed lines into Fig. 9). Remove Figs. 12 and 13 because they are not pertinent to the major thrust of this paper.

Technical corrections

17. Page 10195 lines 2 and 3: costal must be coastal (typo).

18. Page 10198 lines 19: Mematsu must be Uematsu.

19. Table 2: What is MSU%?

20. Figure 2: Why did you insert NOx+O3. It is not used in the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 10183, 2006.