

## ***Interactive comment on “Simulation of dust aerosol and its regional feedbacks over East Asia using a regional climate model” by D. F. Zhang et al.***

### **Anonymous Referee #1**

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General comments: As stated by the authors themselves, the primary purpose of this study is to present a first evaluation of their modeling system over East Asia, going from dust emission and burden to dust radiative effects and regional climatic response. In itself, this purpose is suitable for ACP. The paper is also clearly organized but sometimes difficult to read. For instance, in section#2 (model, data, and experiment design) the description of the model is too brief. Basically, it is a mere list of previous publications in which the reader is supposed to fetch the information required for understanding the physical bases of the model. Developing this part would not only improve readability, it would also provide the reader with a better grasp of the simplifications and assumptions made when designing the model. Regarding this point, the implications of these

simplifications in terms of model numerical output are never discussed in the paper. For example, the authors separate the whole size range of dust aerosols in four size bins only. What is the effect of this poor resolution on the modeled deposition of dust particles during transport? Similarly, it is well known that the optical properties of dust particles depend greatly on their size and composition. Therefore, oversimplifying the description of the size distribution and of the particle composition will necessarily bias the computation of the aerosol radiative effect. If these biases are not estimated, to what extent can one trust the numerical results presented in this paper? Even more important is the fact that the dust radiative effect in the IR is not accounted for when the magnitude of this effect could possibly be so great that it would change the conclusions of the paper altogether. Why not wait until the IR module being currently developed is ready before submitting an updated version of the paper?

Suggestions: When trying to validate their dust emission, transport and deposition model, the authors compare predicted PM<sub>10</sub> concentrations at ground level with the air quality index (AQI) that is a function of PM<sub>10</sub>. What is more, they do so using time averages (monthly) that are not in keeping with the typical duration (a few days at most) of individual dust events. It would be more convincing if they proved the ability of their model to simulate a few, well-chosen intense dust events. For this they can use the PM<sub>10</sub> concentrations measured routinely by the CMA in its network of meteorological stations, some of which are located in the area covered by the model (e.g., Ulmuqi, Lanzhou, Yinchuan, and Beijing). As a member of CMA, the first author of the paper should have easy access to this kind of data.

Conclusion: In my opinion, this paper has been released at a too early stage. The authors should strengthen the argumentation they have already developed in the current version and include IR in their model before resubmitting a new version of this work.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4625, 2008.

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