

## ***Interactive comment on “Examining aerosol indirect effect under contrasting environments during the ACE-2 experiment” by H. Guo et al.***

### **Anonymous Referee #2**

Received and published: 28 November 2006

#### General comments:

The paper investigates the 1st and 2nd aerosol indirect effects (AIEs) using a Cloud Resolving Model for two specific cases (clean and polluted) observed during ACE-2. The paper is generally well-written and the approach taken is an interesting one, combining the meteorology from one case with the aerosols of the other. The model results compare very well with the observations in most cases. This gives an indication of the soundness of the model and critical assumptions made. The resulting 2nd indirect effect is found to be negligible or even positive in the two cases studied. This is an interesting result considering that I believe all GCMs find this effect to be negative, and many also find it the most important one of the two established AIEs. Although I find the paper well worthy of publication, I have some (mostly minor) comments and

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points that I would like to see clarified:

Specific comments:

-Page 11564, lines 1-4: I find this sentence odd: "changes in cloud optical depth (COD) from changes in the cloud LWP could be even larger than aerosol-induced changes of cloud droplet number concentration". What are you really comparing here?

-Page 11566, lines 22-24: What does the size distribution for externally mixed sulfate look like? Is the difference in aerosol number between the clean and polluted case assumed to be entirely due to externally mixed sulfate. If so, is that realistic? In any case, please clarify.

-Page 11570, line 18: What is meant by "evenly-divided"? Why not give the height interval for each of the 5 cloud layers for clarification?

-Page 11573, lines 8-13: You state on the previous page that there is hardly any difference in the precipitation between PACM and CACM, but here you explain the difference in entrainment between the two cases by differences in precipitation. A clarification and quantification of precipitation changes would be good.

-Page 11575: Can one automatically assume that an offline calculation of the 1st indirect effect is practically the same as an online calculation? Please discuss the quality of this assumption.

Technical corrections:

-Page 11563, line 23: Oberhuber et al. (1998) is not on the list of references.

-Page 11566, line 18: Snider et al. (2000) should be Snider and Brenguier (2000).

-Page 11566, line 20: Penner et al. (2004) is not on the list of references.

-Page 11568, line 19: Snider et al. (2000) should be Snider and Brenguier (2000).

-Page 11574, line 18: The difference between 0.47cm/s and 0.47cm/s is not insignificant - it's zero.

-Page 11575, line 9: Why are you using the word "mainly"? What causes the first AIE

other than anthropogenic pollution?

-Page 11576, line 7: Using “the aerosol indirect effect” or “aerosol indirect effects” would be better.

-Page 11577, lines 24-25: Albrecht (1989) is not referred to in the paper.

-Page 11580, lines 21-26: Penner et al. (2001) is not referred to in the paper.

-Page 11581, lines 16-18: Stevens et al. (1998) is not referred to in the paper.

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