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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Aerosol indirect forcing in a global model with particle nucleation" *by* M. Wang and J. E. Penner

**Anonymous Referee #3**

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The authors examine how CCN concentration and the first indirect effect may change due to nucleation mechanisms considered ( boundary layer nucleation and binary homogeneous nucleation) and how these may depend on the primary particles emitted and SO2 emissions. This is an important topic and the papers offers a detailed outlook on the various aspects of nucleation. The main drawbacks are that only the first indirect effect is studied and only sulfates are considered. The paper is well written and all mechanisms are described and analyzed in great detail. Some important conclusions are shown regarding the spatial distribution of the indirect effect and how these may change depending on changes in SO2 and primary particles. This paper is certainly acceptable. Below are few suggestions for modifications.

Minor corrections: Line 17 , Sec. 2.1: Change "is capable to " to a more correct phrase

"is capable of capturing" Suggest replacing PAR in BHN_PAR to something more suitable.(SUL ?) Sec. 4, page 13960: How would the inclusion of other primary particles change your conclusions regarding CCN concentration differences for your different simulations? Results appear to be very sensitive to sulfate emissions (primary) and so if you include other aerosols, your results would change quite dramatically? Section 5 is very compelling and here it would have been very useful to compare your CCN concentrations with measurements. CCN measurements are hard to make , but they exist and the comparison would be helpful to see how vertical and horizontal variations compare and which mechanism does best (if at all one captures everything). This would greatly improve the paper since changes in CCN is the main mechanism identified that connects the nucleation schemes with the indirect effect. Sec. 6: What was the temporal resolution used to sample model fields when comparing them to MODIS. Table 4: What are the size ranges for the dust and sea-salt? Figure 3: Is this the model level with the highest CCN concentration?

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13943, 2008.



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Interactive Comment