

## ***Interactive comment on “Weak sensitivity of cloud condensation nuclei and the aerosol indirect effect to Criegee + SO<sub>2</sub> chemistry” by J. R. Pierce et al.***

**Anonymous Referee #2**

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This paper presents a sensitivity study to evaluate the impact of the Criegee + SO<sub>2</sub> reactions on H<sub>2</sub>SO<sub>4</sub>, CCN concentrations and the aerosol indirect effect. A global model, GEOS-Chem-TOMAS, is used for this work. The authors conclude that the sensitivities of CCN and aerosol indirect effect towards the Criegee + SO<sub>2</sub> reactions were rather weak. Hence, an improved representation of these reactions would not result in an improvement of present-day CCN and aerosol indirect effect predictions.

This paper is well written, presents new and original results, and the topic is clearly within the scope of the journal. Reviewer 1 has already submitted a comprehensive point-by-point review of this paper, which I second. In addition I have one major comment that should be addressed before publication: An inherent weakness of the model framework used in this study is the coarse spatial resolution. The inability to resolve

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small-scale features may result in an apparent low sensitivity of the model, while the sensitivity in reality might be higher. So, while I agree with the authors' conclusion that “improvement in the modeled Cl+SO<sub>2</sub> chemistry would not likely to lead to significant improvements in present-day CCN and AIE predictions”, this does not mean that this chemistry is not important in reality. The authors do address this to some extent on page 33139, but I think great care needs to be taken to emphasize this issue throughout the manuscript (introduction and conclusion), including the title.

Technical comments: Figure 4: The labeling of the color bar (non-integer exponents) is somewhat unconventional. I suggest adjusting this.

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 33127, 2012.

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