

## ***Interactive comment on “New cloud parameterization with relative dispersion in CAM5.1: model evaluation and impacts on aerosol indirect effects” by Xiaoning Xie et al.***

### **Anonymous Referee #2**

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The study carried out by Xie et al. implemented a new relative dispersion treatment in the CAM5 cloud parameterization, accounted for its effect of on autoconversion process, and assessed its impact on the climate and aerosol indirect forcing. While this study is suitable for ACP, I have some concerns for the authors to consider when they revise the manuscript.

1. The title: I am not sure if the new relative dispersion treatment constitutes a “New cloud parameterization”. I am also not convinced that this study has done enough to be categorized as a “model evaluation” paper as shown in the title since only global means, seasonal means, and zonal means are compared with standardized observational data products. I think this study is a model sensitivity study and the title should

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reflect that.

2. The results show that the AIF reduces by only 0.1-0.2W/m<sup>2</sup> in CAM5, and this reduction is very small. This is much smaller than the previous study Rotstayn and Liu (2005), which implemented the same relative dispersion representation in the CSIRO Mark3 GCM. It will be interesting to discuss the difference between these two studies.

3. The treatment of dispersion effect on cloud droplet effective radius in the default MG microphysics scheme in CAM5 is based on Morrison and Grabowski (2007) and the new treatment used in this study is based on an earlier study Rotstayn and Liu (2003). I think it might be interesting to discuss why these two formulae are different (e.g., are they based on observations of different cloud regimes?) and provide a justification of your choice of the scheme.

4. Regarding the reference, I think the authors should try to cite other relevant studies on this subject in addition to their own previous studies, especially when the authors use strong wordings such as “it is well established. . .”.

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