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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessing modelled spatial distributions of ice water path using satellite data" *by* S. Eliasson et al.

Anonymous Referee #2

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Major comments

This paper dealt with the IWP retrieved from several satellites such as CloudSat, ISCCP, MODIS and evaluated the modeled IWP by several GCMs. They found that the differences in IWP between the models were larger than those among the satellites. They concluded that the GCMs tended to underestimate IWP and failed to predict, though the ECHAM-5 showed the better agreement than other GCMs. I found several major issues in the approaches. One is the method of comparisons. As the authors admitted, the satellite retrieval IWP included precipitating ice while the GCM did not include them in the output of IWP. And different sensors on different satellites have different sensitivity. Ideally, they should first simulate the signals using the output from the model with some simulator and then apply the sensitivity to exclude thin ice clouds that

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cannot be observed by the sensor of interest. The authors also should make some effort to exclude the contribution of ice precipitation from the observed IWP, e.g., by applying simple threshold such as 0dBZ or 10dBZ in case of CloudSat. After that, they can fairly compare the observed IWP and simulated one. Especially the latter efforts, excluding precipitating ice from observations, should have large impacts on the results and the interpretation. Without making such efforts, the conclusions were very vague. Even for the climatology studies, we cannot ignore above issues. In its current form, we cannot conclude what is the actual problem in the GCMs, There were almost no discussions about the reason for the failures of the representation of ice in the GCMs. It is also quite instructive that the brief description of ice cloud microphysics schemes used in each GCMs and the general nature of them, e.g.., known issues. And the analyses related to the schemes would be much helpful for the community. In order to analyze the observed data form different sources, the horizontal resolutions should be the same. I would suggest that the paper will be accepted after these issues will be considered.

Minor comments,

Page 12196, section 3-1; what is the actual definition of IWP for the simulations? Usually the GCM output is grid mean value of IWC. If you want to derive IWC in cloud, grid mean IWC should be divided by cloud fraction. (And retrieved value of IWC for CloudSat is in cloud (not grid mean)). Need clarification.

12196 line 13-14, need justification to choose cloud fraction. Each model has its own cloud fraction. Perhaps at least refer to the literature of tendency of cloud fraction information for each model.

There are several places where the IWC should be used instead of IWP. (for example 12207).

Fig,2 the vertical scale is not the same as in Fig,1. The same scale is preferable.

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Fig.4, Prior to the figure, it might be useful to show the comparison of horizontal distribution of IWP (not normalized).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 12185, 2010.