

***Interactive comment on* “Significant Improvement of Cloud Representation in Global Climate Model MRI-ESM2” by Hideaki Kawai et al.**

Anonymous Referee #1

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This manuscript present how the cloud representation has been improved between two versions of the MRI climate model. This topic is very important because the representation of clouds in climate models is essential for both current climate and climate change simulations. The manuscript describes the origins of the defaults of previous model version and why and how the new developments allow to solve them in the new version. The manuscript is very well written, with a clear and complete presentation of the many development steps. It will be very useful for both people who analyses the results of this model and people who develops other climate or weather forecast models. In addition to the descriptive aspect, this manuscript contains very useful information to understand the physics of the phenomena, the hypotheses made, the possible numerical difficulties, etc.

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The only point that could be better addressed is the link between the developments presented in the manuscript and the tuning of the whole climate model, i.e. when the atmospheric model is coupled with all the other components. As mentioned by the authors, the tuning is crucial and often overlooked. The tuning of some parameters is mentioned in the manuscript, but not how they have been tuned, with which target. In addition the tuning can be done in different successive steps, for instance when developing the parameterization and performing dedicated simulations, and/or in a later step when adjusting the whole climate model. Has this approach been used here? If yes, the values that are given correspond to intermediate values or values used within the full coupled model? When presenting and giving the value of the various parameters of the model, it would be very useful to specify (i) if the authors consider that this parameter can or should be adjusted or not, (ii) if it is the case what is the range of possible values, (iii) if a multi-step approach is used for the tuning, if the given values correspond to an intermediate step or to the final step, with the full coupled model.

I strongly recommend the publication of this article after including the minor improvement suggested above. I would like to thank the authors for the quality of their interesting manuscript, which is agreeable to read and easy to review.

Minor comment: please specify the unit of the variables in section 4.2.1

Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2019-23>, 2019.

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