Review of

"Assessing Cloud Representation in Two Microphysics Schemes of MPAS-Atmosphere Model (version 8.2.2) over the Maritime Continent with Himawari-9 AHI Observations"

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Recommendation:

Minor revisions:

General comments:

The reviewer appreciates the authors' efforts to revise the manuscript in response to the previous comments. The authors have compared the two models in physical space by examining OLR and cloud ice water path in Fig. 3 and the vertical profiles of hydrometeors in Fig. 8. They have also analyzed the S1 cross-section normal to Sumatra Island. The different characteristics of upper-level thin clouds between the two schemes may help explain their differing degrees of agreement with the observations.

An important next step would be to improve the representation of high clouds using observational constraints. AHI data may provide useful information for further evaluation; however, as suggested in the previous review, EarthCARE observations can provide more process-oriented information relevant to evaluating and improving cloud schemes. The reviewer hopes that a follow-up study will build on the findings of the present study and further investigate these issues using such observational information.

As described above, the reviewer recommends acceptance of the paper with minor revisions, provided that the authors address the comments below.

Specific comments:

L221-223: The consistency between the schemes in the MPAS simulations and those in the CRTM simulation should be carefully adjusted. Please clarify the inconsistency.

It is unclear what "fixed values are therefore assigned to rain and graupel in the NSSL simulation" means. I assume the effective radii of rain and graupel change in the NSSL scheme because it is a double-momentum scheme. Do the authors mean that these effective radii are assumed to be constant in the CRTM? How about the effective radius of snow and cloud ice?

L309-310, “but also from an overly moist environment and/or biases in boundary-layer mixing and entrainment–detrainment processes”: Does this mean that the simulation is moister than the observations and that mixing is more enhanced? Otherwise, I do not suggest this ambiguous statement because the simulation results do not support it.

L372-373, “This relatively greater underprediction in WSM6 may be related to its lower upper-tropospheric cloud-ice and snow contents and reduced cloud fraction (Figure 8)”: Please check whether this statement is correct, because Figures 8c and 8d indicate that WSN6 simulates more graupel than NSSL.

L530, “the larger nighttime positive bias in WSM6 is consistent is consistent with the scarcity of cloud cover above 300 hPa”: Please remove “is consistent” which is repeated.

L619: Please add references to the EarthCARE satellite:

Illingworth, A., Barker, H., Beljaars, A., Ceccaldi, M., Chepfer, H., Delanoe, J., Domenech, C., Donovan, D., Fukuda, S., Hirakata, M., Hogan, R., Huenerbein, A., Kollias, P., Kubota, T., Nakajima, T., Nakajima, T., Nishizawa, T., Ohno, Y., Okamoto, H., Oki, R., Sato, K., Satoh, M., Wandinger, U., Wehr, T. (2015) The EARTHCARE satellite: The next step forward in global measurements of clouds, aerosols, precipitation and radiation. Bull. Amer. Meteorol. Soc., 96, 1311-1332. http://dx.doi.org/10.1175/BAMS-D-12-00227.1

Wehr, T., Kubota, T., Tzeremes, G., Wallace, K., Nakatsuka, H., Ohno, Y., Koopman, R., Rusli, S., Kikuchi, M., Eisinger, M., Tanaka, T., Taga, M., Deghaye, P., Tomita, E., and Bernaerts, D.: The EarthCARE mission – science and system overview, Atmos. Meas. Tech., 16, 3581–3608, https://doi.org/10.5194/amt-16-3581-2023, 2023.