

## **Reviewer 1**

This study explores the use of polarimetric radio occultation (PRO) measurements for validation and verification of different microphysics schemes implemented on a limited area atmospheric model (WRF). Model simulations of typhoon cases are used to simulate the actually observed PRO measurements using a forward observation operator that is similar to the one developed for ECMWF's IFS model previously reported in the AMT journal. The simulated PRO observations are compared to the actual PRO measurements to gain useful insight into which microphysics scheme performs well in simulating PRO observations. Such comparisons will be potentially very useful given the scarcity of measurements direct related to 3-dimensional distribution of hydrometeor particles, and this study is a nice demonstration of this potential.

One of the major difficulties in such a validation approach would be how to account for erroneous representation of the typhoon position in the model. The authors meticulously accounted for this error source by manually relocating the WRF model field so that the model's typhoon position matches with the position from best track data.

The manuscript is very well organized and written in clear language. Flow of logic is also clear and I see no problem in publishing the manuscript as is except for some minor editorial issues.

I just point out below some minor edits that the authors may find useful, but I do not think these are essential for acceptance of the manuscript.

Thank you very much for the valuable feedback. We greatly appreciate your positive comments on our work. Regarding the minor edits you mentioned, we have carefully reviewed and revised the manuscript accordingly.

Our point-by-point response is provided below in blue for clarity.

Minor comments:

As I understand, when WRF model is initialized, hydrometeor variables are given zero values at the very beginning of the model integration. In such a "cold start" setting for hydrometeor variables, these variables need to be spun-up before any examination is made. It would be informative to readers who may be interested in replicating your

experiments or similar experiments if this point (whether the hydrometeor variables were "cold-started") is explicitly explained in section 2.1.

Thank you for the suggestion. Yes, the experiment was initialized with a cold start. We have added the description: "Each simulation begins with a cold start and is integrated for 18 hours to spin up the model microphysics" in the revised manuscript (line 102) to clarify the initialization process of the hydrometeor variables.

If you did apply cold-start, then I assume the models are integrated for relatively long 18 hours to ensure the model's microphysics is spun-up. If this is the case, this point should also be explained in the manuscript.

Yes, as mentioned in the previous reply, we applied a cold start. To allow sufficient spin-up of the microphysics, the models were integrated for 18 hours for each case. We have clarified this point in the revised manuscript.

Figure 8a: Looking from top to below on the right panel, the observed PAZ data is nearly zero at around 2km height and then rapidly increases as the height gets lower, and this behaviour looks unnatural. I suggest the authors check the quality flag for the PAZ data. If the data is flagged unreliable at these heights, I suggest not to show the PAZ data for such lower levels in the graph. Similarly for Figure 8b and Figure 12.

Thank the reviewer for pointing this out. We have replotted the figures and excluded the flagged data. All figures for PAZ  $\Delta\phi$  have been updated, including Figures 6, 8, and 12. The PAZ profile for the Kompasu case is of good quality, and we have removed data below ~2.1 km to maintain consistency with the lowest height of ray tracing.

Typographic issues:

Equation (1) and elsewhere:  $\Delta\phi$  should be typed with  $\Delta\phi$  in LaTeX, not with  $\Delta 0$  or  $\Delta \varnothing$  as in the manuscript.

We have revised all instances of  $\Delta\phi$  in the manuscript to be properly formatted in LaTeX.

Line 175 and elsewhere: "vortexes" should be "vortices".

It has been corrected.

Line 177 "Even though": should be replaced with "Despite", or the sentence structure should be revised.

It has been revised accordingly.

Lines 197, 249 etc. "presented": should be "present"

It is done.

Line 198 "five schemes however, ...": Start a new sentence with "However", like "...five schemes. However, ..."

It is done.

Line 269 "-70 degrees": Make it clear that this is Celsius.

It has been revised to -70°C.

Line 296 "contributed by": Probably should be "contributed to by".

It is done.