Response to the editor

Reply to the review by the editor (Dr. Peter Alexander) of the revised manuscript of **AMT-2023-132: "Forward operator for polarimetric radio occultation measurements"** by Daisuke Hotta, Katrin Lonitz, and Sean Healy

We would like to express our sincerest gratitude for spending your precious time on overseeing the peer-review process of our manuscript.

Please find below our point-by-point response to you comments. As in our previous responses to the reviewers, your comments are cited in red colour, followed by our replies in black.

For convenience, we have attached a tracked-changes version of the revised manuscript (`diff.pdf`) generated with the `latexdiff` utility; in this file, newly added and deleted texts are highlighted, respectively, with blue and red colours. Line numbers and page numbers shown in the response below refer to those in the `diff.pdf` file.

We hope that our revision have addressed your concern, and thank you again for your careful assessment.

Point-by-point response

Referee 1 stated: "Although the agreement is still not accurate in the quantitative sense, this can be interpreted as both the uncertainty of the detailed hydrometeor field, and a margin associated with the oblateness, and probably the tilt, of hydrometeors, quantities with large uncertainty.". Some kind of argument like this one needs to be included in Section 5, but of course your perspective may be different from that idea. Or please clarify if you believe that this type of statement has already been contemplated in the discussion section.

Response:

We agree that we missed to address this point raised by Referee 1 in our previous revision. In the initial submission, we placed emphasis on the consistency of the simulated and observed Φ_{DP} profiles for AR cases, as shown in upper two rows of Figure 1, and then investigated why the discrepancy between the two is so large in the TC cases. However, on a close look, we do agree with Referee 1 that quantitative agreement is not as good as typical observations that are routinely assimilated in NWP systems, especially with the simulation's visible tendency to overestimate in comparison to the observations. As Referee 1 suggests, we think these quantitative mismatches can be attributed either to the imperfection of the simplistic K_{DP}-WC relation, especially the assumption of constant ar or to the uncertainty of hydrometeor fields in the short-range forecasts of the IFS. We acknowledged the former point in Section 2.2 in the previous manuscript when we discussed our WC-to-K_{DP} model, but we agree that we need to reiterate it in section 5.

In the revised manuscript, we summarised these points in section 5 (L295-299) and also slightly modified wordings in the other section to make the manuscript consistent throughout (L221-222). We also took this opportunity to proofread the entire manuscript once again and corrected a few typographic/stylistic errors (L140,L167,L390).