REPLY to REVIEWER 1

We thank the reviewer for the insightful comments.

Hereafter the reviewer's comment in bold and our reply in italic.

p. 4, around line 15: I think lines 11-15 are one sentence. The authors could consider splitting into two.

We have split the sentence.

Table 2 lists "Gaussian" as the current pattern, but from Fig. 7, right panel, it seems that the model can already handle more complicated patterns. Fig. 7 also suggests that point-target responses besides top-hat can currently be used.

Yes indeed the E2E has been updated to do that, so we have taken out from the Tables thw two items mentioned by the reviewer.

p.9, line 5 – the start of a new paragraph here isn't really needed; it looks like it might be due to the edit at the end of the sentence ending with "to Rosenkranz (1998) model". Also, probably better "to the Rosenkranz (1998) model". In general, I noticed some very short paragraphs that could be combined with surrounding paragraphs.

This has been done.

The numerical weather model probably puts out the mean atmospheric quantities at each grid point. The bottom of p. 6 mentions "particle size distribution assumptions". This is further mentioned at the top of p. 10. However, the steps in taking model output to particle size distribution could be clearer.

We have rephrased some of the sentences

p. 18, line 17: "must be performed before the deconvolution in range (Eq. 5)". Should that read "convolution" rather than "deconvolution"?

yes, thanks for spotting this

p.22 bottom and p. 23 top: subtraction of satellite motion is mentioned twice. Maybe these can be combined into a single mention of this.

One has been deleted.

REPLY to REVIEWER 2

We thank once again the reviewer for the insightful and detailed comments he/she has provided.

Hereafter the reviewer's comment in bold and our reply in italic.

Furthermore, I think the outlook part of the Conclusions section should be adapted to standards of a scientific paper (this is not a proposal) and be made significantly more concise: it's out of proportion compared to the rest of the section (makes up about 50%), it is not reflected sufficiently in the main part of the paper (eg in the form of discussed shortcomings/limitations of the current E2E and analysis method), and it is mostly a wish list (where it remains unclear how much implementation work is needed, what is the level of intention of realisation, on what time frame that is supposed to be realised and how much that might affect the current analysis) that is of no practical use for the reader. I still find the distinction blurry between what is implemented in the E2E on the one hand and what is setup for this study on the other hand. Table2, e.g., mixes them up in my understanding (the caption states "simulator capabilities" ie implementation, but later figures suggest other than top hat PTR are available, ie top hat PTR is the setup chosen for this study).

The future work section has been shortened. Table 2 also has been modified and some of the features eliminated. Discussion about the remaining issues (multiple scattering, polarization) has been added in the text.

Throughout the manuscript, please
- use consistent typesetting of parameter symbols (e.g. LDR is at times set in normal font, most times in italics)
- typeset units in normal font, not italics
- spell out all abbreviations, acronyms, and parameter symbols at first(!) occurrence (this includes but is not limited to NUBF, PIA, SST, SGR, I/O)
- check that appropriate (in-text or in-parentheses) citation styles are used
- replace any appearances of "the Doppler" with an appropriate phrase (velocity? spectra? ...?)
- replace the use of semicolon as punctuation mark unless it really serves a purpose. It can usually be replaced by a period and starting a new sentence (long sentences with several subclauses make it hard for the reader to understand)
- refrain from using brackets in text in place of parentheses
- reduce the use of entire text clauses in parentheses. This makes the text hard to comprehend.
We have followed all reviewer's suggestions

Add references for the WIVERN mission provision expectations (P2L21ff) and the WIVERN science objectives (P2L29).
Done
A short definition of end-to-end simulator would be helpful (P4L8).
Short sentence has been introduced.
P1L17ff: This seems to be a leftover from the initial draft. It's redundant with E2E summary in P1L5ff.

The sentence has been shortened.

P1L15: "The total wind errors seem to meet" - Reformulate in a more scientific manner ("seem" seems

inapproriate for a scietific paper), e.g. "The end-to-end simulations suggest that the errors..." (same re-appears in P28L12)
Reformulated
P2L13: "a Dual-polarization" -> "a dual-polarization

P2L14: "a 3-m cirular" -> "a 3m circular"
P3L19f: "non uniform" -> "non-uniform"
P4L4: "Battaglia et al. (2018) also used" -> Remove "also" to avoid confusion (also as in "in this study, too" or as in "furthermore"?).
P4L31: "Sun-synchronous" -> "sun-synchronous"

All done
P5L8: "A global model" - is really a global model needed, data from mesoscale or local-area models do not suffice?

Well is not needed but it is certainly good to have a model that can cover all latitudes and longitudes covered by the satellite.
P6L1: "These estimates have been been confirmed" - validated?
P6L1: "by airborne" -> "an airborne"
P7 Tab2:
- Why is model resolution a "capabilitiy" of the E2E - can't it handle any other (or higher?) resolutions than 4.3km at the moment (due to memory and/or computation time requirements?)?
- sigma_0 not yet explained nor mentioned(better to be spelled out here?); similarly the simulated radar variables (spell out in caption?).

All corrected.

- What is the multiple scattering flag? Multiple scattering is not discussed anywhere else in the manuscript (apart from the outlook), ie its role and relevance remains completely unclear. I suggest to remove it, apart maybe a mention as current limitation of the method in the conclusion section. (similar applies to ZDR, ADP, KDP - completely unclear what their roles and benefits would be).

We have introduced two additional sentences to explain the importance of multiple scattering and polarimetry.

P8L3: "output from the GSRM" - "from a", maybe? Or did only one GSRM participate in DYAMOND (the previous paragraph suggests differently)?
P9L3: Spell out gamma.
P10L2ff: "with different densities and axial ratio" - This whole part is too unspecific to be of use for the reader. I suggest to focus here on what has been used in the study (Mie spheres), and to mention non-sphericity and polarimetry at max in a discussion of limitations (hence desireable refinements) of the methods (if they are expected to play a role).
P10L11f: "in the area of temperatures" -> in the assumed melting layer (at temperatures ...)"
P10L15: "sufficient to see" -> to demonstrate? analyse?
P12L2: "The PTR could be assumed" -> is assumed?
P13 Fig7 caption: "different PTR", "different antenna patterns" -> remove "different" (showing the same would make no sense, would it?)
P13L13: "H and V pulse" -> pulses; hence subsequent verbs in plural conjugation
P14L2: "interested to" -> interested in
P15L11: Provide a reference for Kw^2.
P1616: "The hatched regions" - Ref to figure that is seemingly discussed here is missing.

All done

P1625: What are the "M-pairs"? Not mentioned/explained before.
P16L27: "for the first M pulses of the pairs" - unclear what is meant. a pair is only two, ie has a first and a second pulse. how can anything be done with first M pulses? Does it mean the first pulse of each of M pairs, maybe?

We have amended this part referring to Fig8.

P17L2: "exceed 3 m/s" -> where does this number come from?

A formula has been introduced to explain it.

P17L6: "using the fact the" -> "using the fact that the"
P17L16: "is projection of the the satellite" -> "is the projection of the satellite"
P17L17f: "and Zco is the measured co-polar reflectivity factor" - in my understanding it is either measured (but than the sum of co- and cross-polar) or co-polar.
P18 Fig9: What is shown as backgound of Panel B (what is PIA?)?
P20L8: "Preliminary assessment suggests" - please add a reference.

P21L5: "The LOS winds [...] present some strong vertical wind shears" - check sentence structure; doesn't make sense.
Figs12ff: Clearly state once (in the text body, preferably) what is the meaning of "distance along the scanning track" (the first interpretation it triggers for me as along the satellite track, which however doesn't make sense; after some thinking I conclude it is the length along the ground projection of the rotating scans and the 2500km are equivalent to a 360° roatation)
P21L9: "are plotted" -> are shown
P21L11: for the strong attenuation examples, isn't the event at >2000km much more significant hence worth mentioning than at 1100km?
P21L15: "(see Fig...)" -> use in-paranetheses (bibtex' citep) citation style
P21L17 and P22L2: "the satellite velocity...substracted out" - redundant
P22 Fig13: Thanks for adding the land-sea and the scan azimuth info to the plot. Very helpful!

All done

P22 Fig13 caption: "Measured clockwise" - how is that consistent with that WIVERN scans counterclockwise (P20L13)?

It does not really matter what convention has been used for the azimuthal angle as far a swe understand where the antenna is pointing at.

P22 Fig13 caption: "In such region" -> "In that region"
P22 Fig13 caption: "so high to bring...well below" -> "so high that the surface contribution is well below"
P22 Fig13 caption: "and in regions with no" -> "and higher in regions with no"
P23L14: "regions with signal" -> signals
P23L15ff: "because of the considerably" - hard to read and as is does not make sense. reformulate. try to reduce the amount of comments in partentheses.
P24 Fig15 (and later figures): What is the meaning of the yellow background?
P24 Fig15 caption: "Continuous (dashed) black contour lines" - My version has black solid and green dashed lines. Correct, please.

All corrected.

P24L6: "Otherwise the estimated LOS Doppler velocities well resemble the LOS winds depicted in Fig. 12B." - In my eyes the remblance is not particularly striking, hence this statement needs more (descriptive) support (or maybe a variant of 12B with reflectivity-weighted or -filtered LOS winds could help).

Added a statement to explain

P24L8: T_B is a math symbol and in my understanding can not (or does not need to) be pluralised, ie "T_{B}s" -> T_{B} (applies also to all further occurences of "T_{B}s").
P24L14: "supercooled liquid clouds in snow" - what is that? maybe "supercooled cloud liquid water coexisting with snow" or something alike?
P25L3: "[formula (16)]" - use proper (journal style conforming) reference to equation
P26L4: "For instance the wind shear" -> "The wind shear"
P26L8: "which results" -> result
P26 Fig18 caption: "NUBF-induced error" -> "Histogram of NUBF induced errors"
P26 Fig18 caption: "NUBF errors are equal and opposite" - doesn't make sense (equal and opposite are contradict each other). Reformulate.
P27L2: "Similarly, estimates" -> "Estimates"
P27L13: "along track distance exceeding 50,000 km)" - along which track? obviously not the satellite ground-track which comes first into (my) mind.
All corrected
P28L23: Still unclear what Thv is. Not mentioned anywhere before. Is it relevant at all?

THV is a very important parameter because it defines the separation between the H and V-pulse. It is a key parameter in polarization diversity Doppler techniques. This is explained at top of page 15