RC1 Response to review:

We thank the reviewer for his constructive comments, which we address point by in the following:

Remark/Question:

In the detection method, the three central coefficients (around zero Doppler velocity) in combination with NCP to compute CR (line 98). However, later on in the paper, a new product called clutter power (CCORH) is shown in Figs 4-6. What is the relationship between CCORH and the clutter power used in the detection method? Looking at the figures, it is easy for a reader to use CCORH as a substitute for clutter power used to determine CR, and it doesn't make sense how you can get the CR curve shown in the right panel of Fig.5 with the two curves shown in the left panel of Fig. 5.

Response:

Thank you very much for this comment and feedback.

- Concerning "CCORH and the clutter power used in the detection method":
  CCOR(H/V) stands for "clutter correction (value)" (dB) and represents the amount of power removed by the clutter-filter at each range gate (with: clutter corrected reflectivity (dBZ) = uncorrected reflectivity (dBZ) + "clutter correction value" (dB)). Here, the clutter-filter itself is not nescessarily restricted to the three central DFT components and therefore can not be used as a possible substitute.
- Concerning "(CCORH) is shown in Figs 4-6": The CCOR(H/V) shown in Figs 4-6 represents the "output moment" after "range aggregation" (for DWD radar systems a 250 m range resolution for the output moments is used, aggregation of ten "25 m range gates").
- Concerning: "it doesn't make sense how you can get the CR curve shown in the right panel of Fig.5 with the two curves shown in the left panel of Fig. 5.":
  To explain, why the curves in our opinion do make sense, two cases:
  1. very slowly moving WT:
     NCPH values around 30..35 dB => no or minimal enhanced noise floor
     CCOR(H/V) values around '-45..-40 dB => dominant fixed target (as expected, WT tower)
     clutter ratio (CR) values around 45 dB .. 50 dB, as the "difference" between the noise floor and the three central coefficients is large
  2. moving wind turbine:
     NCPH values around 60 dB => enhanced noise floor (due to the rotating blades)
     CCOR(H/V) values around '-20..-15 dB => less dominant, due to the enhanced noise floor
     clutter ratio (CR) values around 30 dB, as the "difference" between the enhanced noise floor and the three central coefficients is now smaller

Corresponding changes in the document:

- line 54, Introduction: introducing "in-phase and quadrature-phase (I\&Q)",
- line 90, 2.1 Algorithm: added a requirement for the algorithm to be more precise
- line 91, 2.1 - list item 1: added "(25 m)" to be more precise
- line 98, 2,1 - list item 2: added "for each (25 m) range gate" to be more precise
- line 109, 2.1 - list item 5: added: "(25 m)" to be more precise

Remark/Question:

The sentence “But the spread is large indicating the wind turbine clutter signal most likely co-exists with a strong static clutter signal from the WT tower, which is decreasing with increasing rotation speed (Figure 6)” needs further clarification. I do not see a decreasing trend in CCORH in Figure 6. Also, why does the large spread in CR indicates the co-existence of WTC signal with a strong static clutter signal?

Response:

You are correct. The wording is not precise. The static clutter part is only slightly decreasing between 2 and 6 rpm, an remains more or less constant from 6 rpm on. (Figure 5, left panel). At the same time there is a continuous increase in NCPH. We have corrected the sentence accordingly in the revised document

Remark/Question:

For the data set shown in Fig. 4, how often was weather signals overlapping with the WTC signals? It would be interesting to break down the detection performance for cases when there is no weather versus when weather is overlapping with the WTC.

Response:

We are working on this, as this is a question we have asked ourselves. It turns out that we have to re-process the database as the data from the existing database is not sufficient to make clear distinction between weather / no weather cases. We will report about the results in a follow-up note.

RC1 Technical Corrections:

1. Line 56, “rangebins” should be “range bins”. Please check the remainder of the manuscript for similar corrections.

Response: Thank you very much. We have implemented the correction. Furthermore, we have also fixed this in line 142, 143, caption figure 4, 153, 162, 179, caption figure 8, 188, 221, 236, 241, 310 and 338.

2. Line 96, insert comma after Doppler-spectra.

Response: Thank you very much. We added the comma.

3. Line 134: I would reword the sentence as “A data set comprising of at least one year of the typical meteorological situations would provide a more reliable validation.”

good suggestion! We have replaced the original sentence.

4. Line 142: CCORH, CCORV, TH, TV, URHOHV, and UDR needs to be defined here when they first appeared in the manuscript.

Response: Thank you very much for this comment. We added the appropriate definition and additionally defined "uncorrected" to be more precise here.

5. Line 143: “3 by 3 rangebin area” should be “3-by-3 range bin area”.

Response: Thank you very much. We have changed the text accordingly.

6. Line 145: “ration” should be “ratio”.

Response: Thank you very much. We have corrected the spelling of the word.

7. Line 156: “40% to 10%” should be “10% to 40%”

Response: Thank you very much. We have corrected the order.

8. Line 181: “WEA” need to be defined.

Response: Thank you very much. The abbreviation "WEA" stands for the German word "Windenergieanlage" (wind turbine) and is unintentionally used in two places in the text. We have corrected these two instances and replaced the abbreviation "WEA".

9. Caption of Figure 8: “Black crosses” should be “Red crosses”, “data based” should be “database”, “rangebins” should be “range bins”.

Response: Thank you very much. Yes, the naming of the color was incorrect. We corrected that and additionally enhanced the caption to be more precise.

10. Line 191: “WEA detection algorithm” should be “WTC detection algorithm”?

Response: Thank you very much. We addressed this adjustment in point 8 of the technical corrections.

11. Line 209: insert comma after “In Figures 10 and 12”.

Response: Thank you very much. We added the comma.

12. Caption of Figure 12: “TH” was used previously to refer to reflectivity factor in dBZ. Here “Zh” is used. Please choose one designation and stay consistent.

Paper (wea_frech_rev1.tex): changed accordingly

13. Line 267: ZH is used here for reflectivity.

Response: Thank you very much for Your comment. ZH is incorrectly used here. It should be TH. We changed the text accordingly and added "uncorrected" to be more precise here. We considered adding "uncorrected" to the other text passages in Chapter 4, but decided against it for the sake of readability.

14. Figure 14: “WEA” and “NoWEA” are used in the legends. I think being consistent and using “WTC” and “NoWTC” would be appropriate.

Resonse: here beamblockage is quantified using measuring differences in range in TH for an area with WT compared to a reference area without WT. So the appropriate terms would be rather "WT" "no WT", since wea stands in German vor "Windenergieanlagen". We will change this in the plot.

15. Line 201, add comma after “-30 dB”

Response: Thank you very much. We added the comma (line 301).