

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-404

Anonymous Referee #1

Referee comment on "Evaluation of modelled summertime convective storms using polarimetric radar observations" by Prabhakar Shrestha et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-404-RC1>, 2021

General comments:

The paper presents an interesting study that statistically compares polarimetric radar observations from three storms systems in northwestern Germany to ensemble modeling results. I enjoyed reading the paper and found the results to be interesting, valuable, and very worthy of publication. I do, however, have several comments that I feel would improve the manuscript. I will address these in more detail in the next section.

Individual comments:

1) While I do have a background in polarimetric radar observations and, to some degree, the use of polarimetric radar data in numerical models, I am unfamiliar with most of the models used in this study. Upon my first reading, I must admit that I was a little overwhelmed by the numerous acronyms that were being introduced and found myself continually going back to refresh my memory. After getting a few pages in, I skipped to the back of the paper to see if there was perhaps an appendix that summarized the list of acronyms. Is this something the authors might consider?

2) In section 3.2, I really don't feel like I had a good understanding of how the 20 ensemble members for each case were obtained. That is, it states the 20 ensemble members represent "uncertainties in model physics and lateral boundary conditions by combining five model physics perturbations with four global models are used for the initial and lateral boundary conditions". I found this description to be a little vague. Can you be more specific about what those five model physics perturbations and, more importantly, four global models are? And the results from those runs are used as the initial and boundary conditions for the COSMO runs? Also, what does COSMO-DE stand for? COSMO is introduced earlier but, looking back into the paper, I was unable to find what COSMO-DE referred to.

3) At the beginning of section 5.3, there is a short discussion of clustering. Clustering, I believe, refers to how combined plots of two polarimetric variables will cluster in multi-dimensional space. This seems totally unrelated to computing convective area fractions of a single radar variable, such as reflectivity. Also, can the authors provide a more complete description of convective area fraction (CAF)? I know this is a concept that has been used in numerous papers, but without description I am often left wondering if the convective area fraction is with respect to the grid being used, or with respect to all reflectivity points (for example) above a certain dBZ threshold? It seems to me that a CAF can be defined in many different ways. Also, how is CAF impacted if, for example, a portion of the system that is being studied is moving off of the grid over which the CAF is being sampled?

4) In sections 5.3.1, 5.3.2, and 5.3.3, I am confused why the elevation angle 8.2 is used for a PPI for cases 1 and 3 (Figs. 5 and 9) and an elevation angle of 1.0 is used for case 2 (Fig. 7). Using an elevation angle of 8.2 for a PPI seems very unusual. Please explain why such high elevation angles are being used for these plots.

5) Overall comment on the figures, my philosophy has always been that figure captions should contain enough information that they could be "stand alone", i.e., that the reader should be able to fully interpret the figure without having to refer back to the text. That being said, I feel that much can be done in this manuscript to improve figure captions and, in a few cases, the figures as well. As an example, I felt that the caption describing the right most panel of Fig. 2 could have been much better, particularly the description of the rightmost panel.

6) The text states that there were 104 GRDC stations, 36 were considered useful for this study. These figures show 22 or 23 stations, but the figure is very crowded with all of the stations grouped together in the rightmost 2/3rds of the figure with lots of unneeded and wasted white space on the left, etc. If several of the stations are not going to be used (presumably those that were to be plotted on the left side of each of the figures), I would suggest eliminating the "which space" and making the figure easier to read. Also, are there 20 asterisks representing the 20 ensembles plotted for each station with the some of them just overlaid on each other?

7) Figure 4: Time labels need to be improved.

Specific comments:

1) Overall, the paper is well written. There are some very minor grammatical issues throughout the text. I'll make just a few suggestions here.

2) There is also some inconsistency throughout the paper on whether the word "modeled" and "modeling" should be spelled with one "l" or two "ll"s.

3) Line 7: Remove "however".

4) Line 9: Suggest replacing "besides" with "in addition to".

5) Line 20: Suggest rewording from "Polarimetric radar observations provide ZDR,..." to "Besides ZDR, polarimetric radar observations provide..."

6) Line 32: Suggest changing "thus e.g. provides insight on new snow generation" to "thereby providing insight into the generation of new snow".

7) Line 33: Suggest changing "measure for the diversity" to "measure of the diversity".

8) Line 34: Change "These informations" to "This information".

9) Line 47: Remove "e.g."

10) Line 49: Suggest changing "operator and due" to "operator due".

11) Line 50: Remove "e.g."