

Modelling convective cell lifecycles with a copula-based approach

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Authors' Response

1. Referee #1

1. I have reviewed the content thoroughly and find no suggestions for revision, as the current presentation effectively captures the intended insights with clarity and depth.

R/ We appreciate the Reviewer's detailed follow-up review and positive feedback. We are glad that the updates satisfactorily address the points previously raised by the reviewer.

2. Referee #2

1. This is my second review of the paper "Modelling convective cell lifecycles with a copula-based approach" by Chien-Yu Tseng and co-authors. The authors addressed all my concerns in their response to my comments, and modified their manuscript accordingly. The only comment that has not been implemented in the paper is the generation of precipitation fields using the simulated cell properties, but the authors convincingly justified their choice of keeping this aspect for future work, and I agree with their point. So in my opinion the paper is now ready for publication. I have some last minor comments that came to my mind during my second reading of the paper, and that I'm listing below. I think they can be implemented by the authors at the typesetting stage if they find these comments relevant (the line numbers refer to the revised manuscript without tracked changes):

R/ We appreciate the Reviewer's thorough second review and positive feedback. We are pleased that the revisions addressed the previous concerns. The minor comments the Reviewer raised will be addressed point by point below.

2. L19: often attributed severe convective systems => often attributed to severe convective systems.

R/ Thank you for the comment. We have added 'to' to the sentence in the revised manuscript.

3. Figure 1: It would be nice to add a scale on the right panel. In addition I wonder if you should not replace the 75km buffer by a 200km buffer. I say that because 75km is not mentioned in the text, while 200km is. And in the current figure one could have the impression that the whole domain is not covered by the weather radars (there are white gaps in the left panel), which is fortunately not the case.

R/ Thank you for your comment. The 50 km and 75 km buffers were initially intended to highlight that the centre of the study area was covered with radar data of relatively good quality. However, we agree that the 200 km buffer can better represent the operational coverage particularly for the study domain. The revised figure (see Fig. R1) now includes the 200 km buffer around the radar range, better aligning with the analysis context.

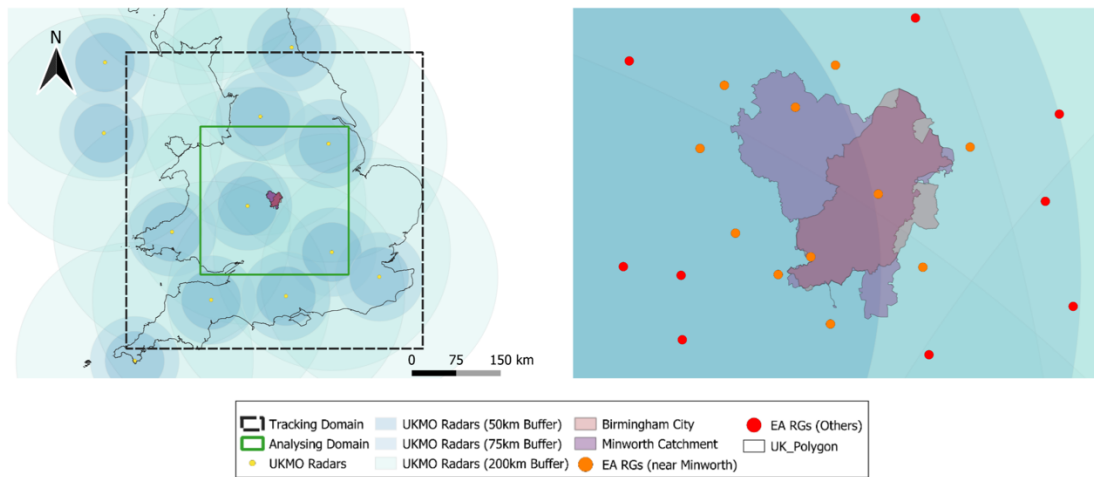


Fig R1. Pilot catchment, study domains and rainfall monitoring networks. Pilot catchment, study domains and rainfall monitoring networks.

4. Table 1: are the intensities referring to 5-min time steps? If yes it could be useful to specify it somewhere in the caption. I say that because the unit (mm/h) can be confusing.

R/ Thank you for the comment. It is indeed essential to specify ‘time interval’ while showing intensity in mm/h. We have revised both the main text in L145 and the column names in Table 1 to "5-min Ave. Areal Peak" and "5-min Ave. Max. Peak".

5. L287: It may be worthwhile to add a (relatively general) reference about copulas at this place.

R/ Thank you for the comment. We have added a couple of general references about copulas (e.g., Genest and Favre, 2007; Jaworski et al., 2013; Czado, 2019; Tootoonchi et al., 2022) to the revised manuscript.

6. Figure 5: I think you could keep only the upper right part of each panel (the diagonal is not very informative).

R/ Thank you for your comment. Indeed, the upper triangular part (excluding the main diagonal) of each panel provides the main message here, indicating inter-dependencies between cell properties under investigation. However, we believe that the diagonal part offers a valuable visual aid in interpreting the results of transforming the marginal distributions to a standard uniform distribution over the interval $[0, 1]$. The full correlation matrix ensures consistency with the expected correlations and aids in our comprehensive model assessment. Therefore, we choose to retain the diagonal in Figure 5.

References

- Czado, C.: Analyzing Dependent Data with Vine Copulas: A Practical Guide With R, vol. 222 of Lecture Notes in Statistics, Springer International Publishing, ISBN 978-3-030-13784-7 978-3-030-13785-4, <https://doi.org/10.1007/978-3-030-13785-4>, 2019.
- Genest, C. and Favre, A.-C.: Everything You Always Wanted to Know about Copula Modeling but Were Afraid to Ask, 12, 347–368, [https://doi.org/10.1061/\(ASCE\)1084-0699\(2007\)12:4\(347\)](https://doi.org/10.1061/(ASCE)1084-0699(2007)12:4(347)), 2007.
- Jaworski, P., Durante, F., and Härdle, W. K., eds.: Copulae in Mathematical and Quantitative Finance: Proceedings of the Workshop Held in Cracow, 10-11 July 2012, vol. 213 of Lecture Notes in Statistics, Springer Berlin Heidelberg, ISBN 978-3-642-35406-9 978-3-642-35407-6, <https://doi.org/10.1007/978-3-642-35407-6>, 2013.

Tootoonchi, F., Sadegh, M., Haerter, J. O., Rätty, O., Grabs, T., and Teutschbein, C.: Copulas for Hydroclimatic Analysis: A Practice-oriented Overview, 9, e1579, <https://doi.org/10.1002/wat2.1579>, 2022.