

Reviewer 3 - Anonymous

The authors review and compare metrics for the “temporal loading” of rainfall events assessment i.e. the temporal distribution of the precipitation intensity within rainfall events. They carry out an extensive literature review and identify 52 metrics which have been applied to describe this temporal loading of events. They categorise these metrics into classification metrics, summary statistics and intermittency metrics. They apply the metrics for a large data set of rainfall events observed in Denmark and compare them regarding sensitivity to temporal resolution and redundancy. Finally, the recommend metrics for the characterisation of special aspects of temporal loading.

The authors have invested much time in analysing the large amount of literature and the many metrics. The paper is not innovative regarding new methods or better description of hydrologic phenomena. However, it is useful for the selection of appropriate metrics for own analyses, so it should be published after a revision.

It is somehow a mixture between a review paper, a research paper and a technical note. For a technical note it is too long for a pure review it contains too much calculations. Maybe it can be shortened to become a technical note. I am not sure if that is feasible but it would allow to concentrate on the most important results and the final recommendations. Also, it would avoid some lengthy descriptions which are partly tiresome to read. A few suggestions for shortening are given below.

General reply - Reviewer 3

Thank you for taking the time to review the manuscript and for your constructive comments. We are pleased that you consider the work useful for researchers seeking to select appropriate metrics.

We acknowledge your point regarding the mixed nature of the manuscript, combining elements of a literature review, research paper and a technical note. However, we firmly believe that this manuscripts strength lies in its structuring around two linked components. Firstly, the literature review establishes how rainfall temporal loading is conceptualised and quantified across different research communities, highlighting substantial variation in terminology and metric usage. And secondly, the large-scale empirical evaluation of 52 metrics across more than 200,000 rainfall events, which quantifies robustness to aggregation and calculation on dimensionless mass curves, and studies the relationships between metrics. We believe that the novel synthesis offered in the literature review is a key scientific contribution of this work, and provides the necessary context for interpretation of the empirical evaluation of the metrics which follows. We believe that converting this analysis to a technical note, and removing the literature review, would render the empirical analysis difficult to interpret and reduce its relevance for cross-study comparison. For this reason, we maintain that the Research Article format remains appropriate, while recognising the need for greater concision and clarity.

To address these concerns, we have substantially shortened the literature review from 7.5 to 5.5 pages (approximately a 30% reduction), with the review methodology, Figure 3, and Table 1 moved to an appendix. The remaining text has been edited to reduce verbosity. We believe these revisions improve the focus and accessibility of the manuscript while retaining the full conceptual and empirical contribution of the work: namely, providing a structured framework for understanding, interpreting, and comparing rainfall temporal loading metrics, and supporting deliberate metric selection in future studies.

Question 3.1. *1. Introduction: The paper discusses temporal loadings of fixed storms based on the Eulerian view of the storms. The authors should mention, that both Euler (fixed storm) and Lagrange view (moving storm e.g. described using radar data) would be possible to calculate such metrics. In addition, the metrics analysed purely describe 1D temporal loadings. The natural storms however have space-time dimensions, so 2D temporal loadings may also be possible.*

Response 3.1.

We thank the reviewer for highlighting this perspective. Our study adopts an Eulerian view, analysing rainfall events at fixed locations and considering only 1D temporal loading. We recognise that natural storms have intrinsic space–time structure, and that a Lagrangian approach, in which moving storm systems are tracked, represents an alternative method for characterising rainfall events and their temporal loading. In principle, similar metrics could be calculated to analyse the temporal profile of a moving storm as a whole; however, our literature review did not identify any established metrics that achieve this. Accordingly, we constrained our study to fixed-location rainfall. We have amended the Introduction’s opening paragraph to explicitly note this scope:

In this study, we focus on rainfall measured at fixed locations (Eulerian perspective), which provides a simple, tractable representation of temporal variability. Lagrangian approaches, which track the evolution of moving storms across space, are possible in principle, but methods for quantifying temporal loading in this context are not yet established. We therefore use the term ‘event temporal loading’ to describe internal variability in intensity over the course of a storm, as considered from a fixed location.

Question 3.2. *2. Literature review: The details how the literature review has been carried out could be omitted if the paper is to be shortened.*

Response 3.2.

Thank you for this suggestion. We agreed that the methodology of the literature review would be better placed in an Appendix, and have now moved it there.

Question 3.3. *3. Statistics regarding the literature review e.g. table 1 or fig. 3 are not really necessary if the paper is to be shortened.*

Response 3.3.

This is a useful suggestion. In response, we have decided that Table 1 and Figure 3 will be relocated to an Appendix in the revised manuscript. The (now shortened) literature review, directs readers to go to the appendix if they are interested in summary overviews of the reviewed literature.

Question 3.4. *4. Recommendations: This should be one of the main outcomes. The equations for the recommended metrics should be given.*

Response 3.4.

As suggested, we have amended the Recommendations section to include equations for the recommended metrics.

Question 3.5. *5. References: The references should be listed beginning with the last name of the first author.*

Response 3.5.

The reviewer is correct that the reference list was incorrectly formatted. This has now been updated so that the last name of the authors is listed first.