

Review Comment hess-2022-94

Title: Critical assessment of metrics and methods used to quantify temporal loading of rainfall events

In this paper a large set of (52) metrics are investigated, that describe temporal loading (i.e. temporal evolution) of rainfall events. This first part constitutes a rather elaborate literature review that concludes with a summary table listing the various metrics and in how many studies the authors found them to be used. Then, these metrics are calculated for a large number (>100,000) rainfall events recorded at Danish rain gauges between 1975 and 2025. The metrics are evaluated with respect to their degree of overlap (redundancy) and robustness to changes in temporal resolution (aggregation) and choices made during data processing. The study aims to answer four research questions: RQ1: What key properties of rainfall event temporal loading are commonly measured, and why? RQ2: How sensitive are these metrics to the temporal resolution of the rainfall data? RQ3: How does de-dimensionalisation of rainfall events affect metric values? RQ4: Which metrics are strongly correlated, suggesting they may be redundant or are suitable for use in cross-comparison studies.

The study represents a diligent amount of work, but what does not become clear after reading through the results and conclusions, is a justification for why this work is needed. A summary and comparison of the many metrics is surely informative, but the question remains what new insights we can gain from it. What can we not do now that this evaluation of metrics will enable us to do? One of the reasons mentioned for conducting the study is the need to incorporate temporal loading characteristics in the development of design storms for flood modeling and flood risk assessment. Representing temporal loading of storms in a statistically representative way is indeed not straightforward and new ideas or insights could be really valuable for the field. It seems like a missed opportunity that a study of such a large number of rainfall events restricts itself to just descriptive metrics and does not provide any statistical analysis that could feed into, for instance, recommendations for calculation of return periods in flood risk analysis and development of design storms.

In its current version, the analyses seems more suitable for submission in the form of a technical note. This would require drastically shortening the content, some suggestions are provided in the following.

Detailed comments:

1. Introduction: Several statements are made here that would benefit from a cited reference. A couple of examples

- P2, L 39: "rainfall event temporal loading is often oversimplified or overlooked in impact modeling applications." Not sure that this still represents current practice?
- P2, L 44: "symmetrical, centrally peaked intensity profiles are commonly used in flood modeling (..)". Many other approaches are used for flood modeling these days. Please place statement into context
- P3, L58: "The relevance of each aspect varies by (...) and can result in misplaced emphasis and misinterpretation". Please provide a reference for this statement?

2. Literature review: this review covers 7.5 pages summarizing metrics found in the literature that are then summarized in a nice overview table. The information density of this section is quite low (it's very wordy), and could easily be summarized in just the table with short descriptions of the metrics (Metric name | Metric description | References of studies where metric was used).

3. Methods:

- L 275: A peculiar statement is made here that requires better justification: "For temporal loading, which is interested in what happens around the peak, the way in which the edges of the event are defined is particularly important, but in this research we do not investigate this further." If this aspect is so important, and central to the subject of study, should it not be particularly addressed?

- L294: "Rainfall temporal loading metrics are implemented in Python based on the definitions provided in the original publications"

It strikes me as odd that in a study that focuses on the calculation of metrics, no equations are provided of how metrics are calculated.

4. Results and discussion

4.1 Sensitivity of temporal aggregation:

- the findings in this subsection on the effects of temporal aggregation are rather obvious, namely that values of peak intensities are particularly sensitive to temporal aggregation. It doesn't really seem worth analyzing and reporting?

4.3 Metric redundancy: the same comment applies here: is it really a new insight that metrics related to time of the peak are related, and similar for mass distribution etc.

5. Recommendations

"A central contribution of this paper is the argument that analyses of rainfall temporal loading must begin with a clear definition of the aspects most relevant to the research question or application."

This seems like a rather generic and common sense argument. Which comes back to the earlier comment that the new insight provided by this study is not very clear.

6. Summary and conclusions

This section should preferably restrict itself to presenting the conclusions. A short summary is already provided in the abstract of the paper.