

# Probable Maximum Precipitation Estimation in a Humid Climate

The paper focuses on estimating and comparing Probable Maximum Precipitation(PMP) values from different statistical and physical methods. The statistical methods considered were Hershfield and Modified Hershfield methods, and the physical method used was the convergence method.

The manuscript is interesting, and it deserves publication in the NHESS journal. However, the authors need to do a major revision to address some issues and to improve the paper in terms of organization, flow, content, and grammar.

## *Major comments:*

- 1) The main paragraph in the introduction is considerably long and not clear about its message. It is also weak in terms of flow. Furthermore, the authors list a large number of studies; however, the strengths, deficiencies, and implications of the cited references to your work are not mentioned and how these findings are relevant to your work. The review of the literature should be presented in a way that the readers can understand what has been done related to the topic in the past and build the argument why your contribution is a valuable extension of the previous work. A one-line summary that may not be even relevant to your approach is not sufficient.
- 2) the overall goal of the study is not well defined. I suggest considering the following items in introducing the goals of this study:
  - a. Do you claim that PMP calculations are not available in that region? Or you think that the current estimates need to be revisited?
  - b. Furthermore, explain why you are estimating the PMP24 from both statistical and physical methods?
  - c. Do you intend to compare the results obtained from the two and specify which is the better method? In any case, the authors should make their intentions of the study clearer.
  - d. The authors also need to describe the statistical metric(s) and measure(s) which should be employed to identify the superior method.
- 3) The methodology section is very brief. More detailed explanation of the methods and equations are required in order to allow the reproducibility of the implemented approaches. Furthermore, the purpose of some of the equations and calculations is not described and the reader could not understand how they contribute to the overall estimation approach. The general flow of the methodology section also needs to be improved.
- 4) The results section must highlight the main findings from each figure and table.

***Minor comments:***

P3L2: This is more suitable for the beginning of the introduction.

P3L11: How is that basin important? Is it important in terms of water supply? Or it has geopolitical importance?

Figure 1: What are the “+” signs in the map? It should be mentioned in the legend. Also, Include the map of Iran, in a larger regional context, in the corner of this figure and demonstrate the location of this basin. Additionally, mention the elevation unit beside “DEM”. The “d” letter in the legend is overlapped with the basin boundaries.

P3L13: For which period? Last 30 years?

P3L14: Air pressure? Vapor pressure? Saturated vapor pressure?

P2L13: Are these climatological data taken from the only synoptic station available in your study? If so, please mention it.

P3L14: The sampling frequency and the calculation time-steps should be mentioned. For instance, whether the stations provide hourly values? Or daily? Or for the wind speed data, in what elevation is the wind speed measured? 10m or 2m? It would be good to present this information in a table.

Table 1: Also mention the average annual precipitation in each of these stations.

P4L2: Do you mean the “Annual maximum series”? Does it also work with the “Peak Over Threshold” extreme series?

P4L2: What does this frequency factor mean?

P4L3: Are the “Km” values from the chart method based only on the average extreme value and duration? Are the charts similar for the eastern and western US?

P4L5: Do you mean “The United States”?

P4L5: Why did they modify it? What was wrong with the original approach?

P4L2-L5: The sentence is too long. Also needs grammar revisit.

P4L7-L10: It turns out that only the first equation is used! What is the second equation then used for?

P4L7: Is the  $X_{\max}$ , a single value? Is it the grand maximum, or a time series?

P4L12: What are the differences between these methods? Why did you choose the “convergence” method?

P4L18: Did you also consider the discharge data? If so, mentioned it in the data section. If not, how did you estimate the maximum discharge?

P4L21: What is the purpose of doing “Moisture maximization” and “Wind Maximization”? Are they parts of the convergence model? Or they are different PMP calculation methods? From section 2.3 it turns out to be so; however, it seems to be a different PMP estimation method according to P4L23.

P5L1-L14: How are the FM and MW used? It is not clear from the text that why they are calculated?

P5L21: How was this equation calculated? If this is a polynomial function fitted to the point data, it needs to be shown.

P5L26: The application seems to be of limited use for other regions given the fact that information from limited gauges in one basin is considered in its development.

P6L1: What are the summary of findings from Table 2? What are the differences and what are the sources?

P6L1: Km values and PMP24 values from the standard and modified approaches are considerably different. Which one is more accurate? How is the better approach determined?

P6L2: The isohyetal maps also show significant differences between the PMP24s. How do you discuss and justify this issue?

P6L6: How did you characterize these storms? What measures did you consider in selecting these 8 storms?

Table 3: How many days did each of these storms last?

P6L9: What interpolation method has been used to generate Figure 4?

P6L13: What do you understand from table 4 and table 5?

P7L4: This section is supposed to discuss the physical method. Discussion on the statistical method should go to section 3.1.

P7L4: For the physical method, is there only one PMP value for the whole basin? Why the physical method gives a different value for each storm, but the statistical method gives one fixed value for the entire period?

P8L14: You compared two statistical methods and the results showed that they lead to considerably different PMP estimates. You did not make any comparison between the different physical methods to show how their results would compare.

P8L15: Why the statistical method gives different PMP values for different locations; however, the physical method gives a single value for the whole basin. It turns out that the PMP values from the statistical method change only in space dimension, but those from the physical method change only in the time dimension.