Probable Maximum Precipitation Estimation in a Humid Climate

Dear Editor,

The authors appreciate the editors and reviewers. We checked the manuscript carefully for typos, and co-authors' affiliations, terminology, updates of data in tables, or updates of variables in equations. A point-by-point response to the Editors' and Reviewers' comments is below. Also, all changes were determined in the main text by using red color.

With warm regards,
Corresponding Author,
Bakhtiari, B.

Comments:	
Abstract	
1. The information on the frequency factor is not in my view so relevant to be put in the abstract (further you missed to add its units!). I suggest to delete it unless you have a strong argument to keep it (which is not clear in the abstract and should be added to it)	This sentence was deleted from abstract.
2. Considering uncertainty of computed values, is rather clumsy to add so many significant digits to your results in the abstract. Values to be reported are 448, 201 and 143 mm, with no further digits.	Mentioned values and related sentences were revised.
3. I would add a clear statement that the most reliable estimate for PMP is 143mm (if I get it right your conclusions!)	Of course. It's correct. Physical result is the most reliable estimate for PMP which is mentioned in the abstract.
Introduction	
Local context should be better explained in the introduction. What are the consequences of extreme precipitation in the region? For which specific applications in the considered region is the value of PMP needed?	Required revision was done and was added to text. Extreme rainfalls and flash floods which occurred in the spring and summer seasons are the most common hazards in northern Iran include the southern Caspian region representing provinces of Mazandaran, Gilan, and Golestan. In recent years, Golestan province experienced deadly floods in its historical data. Due to consequences of extreme precipitations and floods in this region, it is necessary to estimate the values of PMP and PMF to reduce the risk of them. The value of PMP is needed for designing irrigation and drainage channels, sewage collection and disposal systems, and the maximum amount of water entering the reservoirs in this region.
Minor point: Line 18, page 3 K_m is NOT number, it is a value "In other words, K_m is then the number of standard deviations to be added to obtain PMP."	This sentence is from "Manual on Estimation of Probable Maximum Precipitation, page 66, section 4.2-1, Line 12". If the maximum observed rainfall X_m is substituted for X_t, and K_m for K, K_m is then the number of standard deviations to be added to to obtain X_m, or $X_t = \overline{X}_n + K_m S_n$ (4.2)
Conclusions	
*Pleas, insert a discussion of the actual meaning of PMP. From your description, I understand that is it an upper limit that you expected NEVER to be exceeded. However, "NEVER" is quite problematic to be consistently maintained in reality if you wait sufficiently long (eventually millions of years)!	Required revision was done and was added to text. In the theory definition, the PMP refers to the upper bound with a zero probability of exceedance. In practice, these estimates are based on the steps that hydrometeorologists use to maximize observed large storms to achieve PMP value. Therefore, there is a very small probability that the operational estimates of PMP may be exceeded.
A short paragraph relating PMP to the return time values of other approaches such as General Extreme Value theory could be useful. Example: if P_50 is the accumulated precipitation in 24 hours that is expected to be reached once every 50years, how are P_50m and PMP related? My comment 2 of the abstract applies to the conclusions as well	The sentences associated with the return period and General Extreme Value theory was added. In response to "if P_50 is the accumulated precipitation in 24 hours that is expected to be reached once every 50years, how are P_50m and PMP related?" it should be noted that the relationship of P_{50} and PMP was investigated in the study area. The results showed that there is a good correlation between P_{50} and PMP in 99% level. Since this matter has not been discussed in this manuscript, related explanations have not been added to the text. If it is necessary, we will add it to the manuscript. Also, the PMP values were revised based on reviewer's comments.
* Please, relate the results to an estimate of the actual hazard and its consequences. What would be the local impact of a PMP with a value of 143mm? and if this value were wrong and the higher estimate correct (448mm), what would it be the consequences of this error? Finally, are local structures adequate if PMP is 143mm? and if it is 448 mm?	Required sentences were added to text. It should be noted that all of these approaches have uncertainty in the estimation of PMP. In the statistical approach, significant uncertainty can take place from the use of the enveloping curve of the frequency factor, and uncertainty in the sample mean and standard deviation. Therefore, Hershfield's frequency factor in standard method led to overestimate PMP (448 mm). In order to reduce uncertainty in the PMP estimates, the revised method was used and led to decrease the PMP estimates (201 mm). These values indicated that the PMP obtained from the revised method and physical approach are closer to the $(P_{24})_{max}$. Since the magnitude of point PMP at an individual station should normally not exceed three times the highest observed rainfall from a long period of rainfall data (Hershfield, 1962), the use of the standard method is not recommended in this basin. Because the ratio of point PMP_{24} at the study stations in the standard method to $(P_{24})_{max}$ was more than 3. Due to considering the physical characteristics of the air mass in the hydrometeorological approach, it is suggested that this approach is used by disregarding uncertainty. If the results of the standard method are used for designing local structures, the construction costs will be increased. By including PMP analysis together with extreme rainfall return periods optimum decisions can be made easier. Such studies are crucial for basins with high population and exposed to various kinds of water-related natural disasters. Due to the existence of Kowsar dam in this area, it seems that the amount of precipitation adequate and rational for this dam.

The authors wish to thank the editors and reviewers for their time in effort in reviewing our manuscript. We hope the changes listed have made the manuscript suitable for publication and we look forward to your response.
Thank you again for your time and effort and for helping us to improve the manuscript.