

Interactive comment on “Increase in surface runoff in the central mountains of Mexico: lessons from the past and predictive scenario for the next century” by N. Gratiot et al.

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General comments:

The paper addresses a very relevant topic on the increase of surface runoff in central Mexico. It tries to link a significant increase in surface runoff to land use changes in the seventies. The conclusions are based on statistical trend analyzes between 1956 and 2001. However, concerning the analysis two points should be emphasized and/or improved:

1. The authors show that the results are not biased by the possible trend between C2904

manual measurements of the past and current automatic measurements, by comparing both techniques for water level observations for 2008. They conclude that they can be compared, since $Q_{\text{manual}} = Q_{\text{automatic}}$. However, they completely neglect the possible trend over time in the Q - h relation of the flume. Especially, because the authors mention that the calibration of the flume ended in 1955. Some critical notes would be necessary, because this is the basis of their analysis.

2. The authors show that surface runoff increases in the investigated period and suggest that this is caused by land use changes in the seventies. However, I think that this hypothesis can be better tested if the time series is split into two parts: the period before 1970 and the period after. Then apply on both periods the statistical tests and see if there is a significant difference between the two periods or not.

Overall, the paper is of good quality, well written, and shows a straightforward way of assessing rainfall-runoff trends, although, (I think) one should be cautious by extrapolating 50 years of data into ‘climate change disasters’. After consideration of the above mentioned comments and the specific comments below, I think this paper is suitable for publication.

Specific comments:

P = page; L = line; S = section; Eq = equation; F = figure; T = table

1. P6866 L19: It is stated that Mexico faces a decrease of about 70
2. P6867 L24: Skip “in thirty years”. This is redundant since the specific period is already mentioned.
3. P6867 L25-27: I do not see how the meteorological conditions ‘imply’ that 77

4. P6868 L15-18: This sentence is confusing, because first the land cover of 2000 is described and then the land cover of 1975 combined with 'decreases' and 'increases'. Please rewrite or add a table.
5. P6869 L9-11: Maybe add correlation coefficient between the two rainfall series. It is quite difficult to see the 'similarity' in Figure 2.
6. P6869 L22: Please comment on the possible difficulties caused by the ended calibration of the flume (see also 'general comments', point 1). What about changes in the rating curve due to sedimentation, vegetation growth, etc
7. P6870 L6: LT means 'Local Time'?
8. P6870 L11-17: This does not say a thing about the errors in the discharge, this only say something about the errors in the water level (see point 1 in 'general comments').
9. P6872 L7: What is 'Dirac precipitation'?
10. P6872: This paragraph is really unclear to me. What is Q_{inst} ? What is $ctte$? What does Figure 5 tell me?
11. P6872 L26: Rainfall has the dimension volume per time. Please add e.g. $P_d < 5\text{mm/day}$.
12. P6873 Eq5: Where is this equation coming from, although I am willing to believe it.
13. P6874 L15: Replace Sect. 4.2 into Sect. 4.3
14. S5: Please elaborate on the possible effect of climate change on the partitioning of base flow and surface flow.

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15. S6: The conclusions are not very well connected to the results of the paper. They more describe some general statements from the introduction. This can be improved.
16. P6878 L12: Where is the 70% coming from? In your results I only see 30-50% increase.
17. T1: is gauging station 'Cointzio' part of the watershed or not? This is conflicting with the information from the text (p6868 S3.1) and Figure 1.
18. T2: Please add units to 'S'.
19. F1: Please add abbreviations of rain stations in caption. Please clarify the difference between grey and white circles. I thought it was inside or outside the catchment, but why is Acuitzio del Canje then outside of the catchment?
20. F2: Please change unit of P into mm/month
21. F6: Please be clear on units of P (mm/year; mm/18 days; mm/day).
22. F7: Why is only the effect of τ on the partitioning only shown for ABF? Maybe for completeness add this 'uncertainty', although it can be calculated from 100% minus the already drawn area.

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