Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-644-RC3, 2017
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A two parameter design storm for Mediterranean convective rainfall" *by* Rafael García-Bartual and Ignacio Andrés-Doménech

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Received and published: 16 January 2017

The paper describes an innovative approach for estimating the design storm for the city of Valencia. The proposed method is compared with the traditional method that is based on the application of intensity-duration-frequency (IDF) curves.

The paper is interesting and therefore I recommend publication. I think a moderate revision is needed to improve the presentation and to better highlight the potential for technical application in the city of Valencia and other contexts. In fact, the approach based on the application of the IDF curves is well known along with its limitations, its performances are repeatedly tested and therefore it is widely applied for the mitigation of the impact of extreme events. Proposing an alternative that may overcome the above

limitations is a commendable effort, but I think the reader needs more technical details to avoid an unrealistic assessment of the impact of extreme rainfall.

In detail, I think the authors should address, by extending their discussion, the following questions.

1) The approach relies on fitting with a single principal component the cumulative rainfall P and maximum intensity i10 for several rainfall events. For the case of Valencia, the procedure was successful in identifying a single principal component explaining 92% of the variability of P and i10. I notice that the principal component gives much weight to P and less weight on i10. What is the effect for the case of Valencia of the 8% unexplained variability by the first principal component? What kind of uncertainty could be induced by neglecting the second principal component? If the explained variability by the first principal component was lower, could one tolerate the approximation? Finally, is there a way to consider the second (and subsequent ones) principal component if needed?

2) What about uncertainty in determining eq. 25? Would it be possible to quantify the goodness of the fit of the regressions displayed in Figure 2? What if the regressions were not well performing? What kind of uncertainty would be introduced?

3) Is the gamma function explaining well the observed structure of the considered rainfall events? Would it be possible to know the goodness of the fit?

4) The IDF curves are known for overestimating the magnitude of rainfall events, especially for low durations. It seems that the proposed approach is resolving this limitation, but I am concerned by possible underestimation, which would be concerning from a technical point of view. Do the authors think that the proposed approach may lead to underestimating the impact of extreme rainfall?

5) Would it be possible to explain why the comparison presented in Figure 4 shows a different outcome for the longest rainfall duration?

Finally, I have the following minor remarks.

a) Please define the symbol i10. I understand it is the maximum rainfall intensity of a given storm, but I do not understand why the subscript 10 is used.

b) Please make clear when introducing Figure 2 that the different patterns are identified basing on storm duration. When reading at the bottom of page 10 I had the feeling that patterns were identified by looking at the exponent of the regression lines. My doubt was resolved when reading the text at lines 22 and 23 at page 13. I think the authors should make clear at page 10 already that the regressions refer to different storm durations.

c) I think the authors should define at page 11 what is meant by “magnitude” of the storm event.

d) In eq. 28 the symbol “i” looks like an exponent. I suggest to change the notation.

e) Please use the symbols IDF and ID coherently. I think both of them indicate the depth-duration-frequency curve.

f) Please clarify how the numbers of blocks at line 26 of page 13 were identified.

Overall I think this paper is an interesting reading and therefore I would like to congratulate the authors.

Alberto Montanari

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