

Interactive comment on “Rainfall and streamflow sensor network design: a review of applications, classification, and a proposed framework” by Juan Carlos Chacon-Hurtado et al.

Anonymous Referee #3

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General comments

The manuscript presents a review of the existing methods for network sensor design for hydro-logical purposes. Moreover, in the introduction, the authors denote the lack of a unified methodology for network sensor design and, in the last paragraph, they propose a general procedure to fill this gap.

I personally have only few comments and I would suggest the publication of the paper, provided that the authors extend the text keeping in mind the following comments:

- I agree with the other two reviewers that a general overview about the network sensor densities at global or continental scale is missing. I would suggest to support these considerations with tables or maps to show some relevant charac-

teristics of the networks. In case this is not possible because of the lack of data, I would suggest to add some study cases or examples that might be useful for decision-makers. This would trigger considerations for stakeholders about any actions to be undertaken and to provide answers to questions like “Under which circumstances should I re-evaluate my sensors networks? Should I improve, reduce or relocate sensors?”

- Some considerations about the advantages and disadvantages of the various methods for network sensor evaluation is missing. For example fractal approach methods suffer from the fact that they consider the sensors located in a two-dimensional space, ie not considering the elevation. On the contrary, orography might play an important role in the location of the precipitation maxima, thus fractal methods should be employed only in relatively flat areas. Another example where advantages and disadvantages might be relevant is the case of the methods based on expert judgment since these methods are, by definition, biased because of the expert.
- Since the method proposed in Section 5 is the novel concept introduced in the paper, I would appreciate an application of the method in a real case (for example a case when the optimal criteria are met to exit the loop and another case when they're not met). This would help the readers to conduct their own experiments based on this new tool.

Specific comments

The numbering of the Sections is sometimes confusing, I would suggest to simplify it (eg reducing the sub-sections) to get the text more smoothly. For example the Section 4 is very meager and I would merge it with another section (perhaps the last one?)

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Technical corrections

- Please cite correctly the paper by Capecchi et al 2012 (not Cappechi et al 2011) and change the text accordingly
- Eq 13: The definition of joint entropy is not well explained for a non-expert. “max” in the right hand side of the formula is not clear, the dots “...” are not clear
- Eq 14: “m” stands for? “H” stands for? Please specify
- Since I'm not a native English speaker, I have no issues on the language. Anyway some typos are found; here some examples:
 - pag 16, line 531: “Heaviside function” with the capital letter
 - Figure 6, conditional block (7): “Is it...” instead of “Is It...”
 - Figure 6, conditional block (9): “Is it...” instead of “It is...”

HESS review checklist

- Does the paper address relevant scientific questions within the scope of HESS?
Yes
- Does the paper present novel concepts, ideas, tools, or data? Yes, the unified methodology for optimal sensor design presented in Section 5 is a novel tool.
- Are substantial conclusions reached? Yes
- Are the scientific methods and assumptions valid and clearly outlined? Yes, but the review of the existing methods is sometimes confusing in terms of classification and Sections numbering
- Are the results sufficient to support the interpretations and conclusions? As stated previously in the General Comments, I would present a practical demonstration of the method described in section 5, to support the conclusions



Interactive comment

- Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Even if this is a review paper, a novel method is introduced (in Section 5). According to my opinion a practical example of the method should be shown to help its reproduction by the readers
- Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes they do
- Does the title clearly reflect the contents of the paper? Yes
- Does the abstract provide a concise and complete summary? Yes
- Is the overall presentation well structured and clear? I would re-organize the Sections numbering
- Is the language fluent and precise? Not applicable
- Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes, minor further details are needed in some equations (see above)
- Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? (see above)
- Are the number and quality of references appropriate? Yes
- Is the amount and quality of supplementary material appropriate? Not applicable

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