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Hydrology and Earth System Sciences Discussions

Interactive comment on "Development of a method of robust rain gauge network optimization based on intensity-duration-frequency results" *by* A. Chebbi et al.

Anonymous Referee #2

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General comments

As it stands the paper has an uneven feel to it, a whole page is dedicated to literature on robust optimization, but in the remainder of the paper it is not clear which methods discussed in these references are actually used or how they are used. On the other hand, no references are given to earlier work on sensor network design and augmentation, such as Delhomme (1978); Amorim et al. (2012); Cheng et al. (2008); Ashraf et al. (1997); Pardo-Igúzquiza (1998); Barca et al. (2008), or even the authors own work Chebbi et al. (2011). The core of the paper, the formulation of the optimization

problem and its implementation, is done in less than one page.

Specific comments

- In the first sentence of the abstract the link between purely temporal data (IDF) and spatial location is missing.
- In the introduction there are many papers listed as references for robust optimization, but there is no indication which of these are directly relevant to this paper. Given the lack of both a definition of robust optimization and a description of the method used in the paper this is a problem. Especially because there are multiple approaches, both on a philosophical level Beyer and Sendhoff (2007, page3192) and an implementation level Bai et al. (1997).
- The relation between the first sentence of section 2.2 and the rest of the section is unclear. Moreover, a reference to a publicly available full description of the Montana model is needed.
- It is not sufficiently clear whether or not any of the work described on page 14209 was done as part of the work for this paper, which makes it difficult to judge whether the description given is adequate.
- On page 14210, line 1: the authors write "T ... reflects the hydrological risk". Even in the simplest definition of risk it is probability times consequences, the return time only supplies the probability. More explanation is needed.
- On page 14210 a new section should start, "IDF curves: The Montana model" does not match the contents.
- On page 14212, line 2 it is stated " ... are considered for risk assessment", but there is no risk assessment in the paper.

- On page 14212, line 11 starts with "The robust optimization method requires ...". This raises the question which method is meant. There are several and up to this point the authors have not specified which one they use.
- Page 14212, Eq. 7, the use of the abbreviation Prob for the weighting factor for the different terms in the objective function is misleading, this is not a probability.
- Page 14212,14213: As noted by referee 1, the definition of OF is in terms of OF itself, this needs to be corrected. The optimization problem needs to be specified in standard form, with a specification of the objective function, the set of feasible solutions and the constraints.
- Page 14215, line 7: why are these networks called robust? A comparison with the networks from Chebbi et al. (2011) would be interesting.

Technical corrections

- On page 14206, line 20: 14 rain gauges, line 24: 13 stations, please explain.
- On page 14207, line 8, a reference is made to work of Nikulin, which is described as "published". However, (1) availability on a website is not the same as "published". (2) it is a bibliography on Combinatorial optimization and scheduling theory and therefore at first sight not relevant, it would help if the authors would indicate which references they feel are important to this paper.
- On page 14208, line 20: " ... assumed In ..." Upper case letter in the middle of a sentence.
- On page 14209, line 0: In the term Montana model, the word montana is not capitalized.

- On page 14210, line 9 refers to Eq. 1, where Eq. 2 is meant.
- On page 14210, line 19: index error in subscript on first γ
- On page 14226: in figure 1 there are only 11 dots corresponding to selected stations. The region numbers obscure the results.

References

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