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Interactive comment on "Using R in hydrology: a review of recent developments and future directions" *by* Louise J. Slater et al.

Louise J. Slater et al.

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We would like to thank Reviewer 2 for constructive comments on our manuscript. The comments are helpful and will certainly improve the quality of our manuscript. Below we provide the Reviewer's comments verbatim in black italic text, and our responses are immediately below each comment in blue text.

"I enjoyed reading this paper, which is for sure useful to get an overview on what R can do for hydrologists and what hydrologists can do for R. I am an R user, and I have also developed packages, which places me at one side of the spectrum of potential readers of this paper. As such, I can benefit a lot from the information provided, especially

regarding tools on subjects I am not an expert in. I wonder whether the great amount of information provided in the paper isn't overwhelming for an R beginner. It is unlikely that a R beginner will comment the paper in this discussion stage so, if I were one of the Authors, I would suggest to ask, e.g., a couple of master or starting PhD students to perform an internal review of the paper as non-expert readers (that's just an idea)."

We thank the Reviewer for their positive comments. We find that the comment about the diverse readership of this manuscript (in terms of beginners vs. experts) is very relevant. We have thus shared the manuscript with one MSc and one PhD candidate to ask for their feedback and they both said they found the paper straightforward to follow; in fact both mentioned that the workflow figure was useful. They also raised some minor points that we will use to improve the revised version of the paper. The revised manuscript will aim to make it as easy as possible for hydrologists to navigate R and the incredible amount of R resources that exist.

"Besides the many advantages of using R (and open data and software in general), I would have expected a mention on possible drawbacks. A couple of examples follow:

- The easy accessibility and usability of open tools results, sometimes, in applications without critical scrutiny on what one does. It happened to me to receive an email from a user of my package asking me to tell him/her how to apply the methods to her/his data. A few months later I've been asked to review the paper written by the same R user who, then I realised, had no clue about the meaning of the methods applied. In other words, how can the misuse of software be reduced within the open source community? (I am aware that this happens also with proprietary software)."

We feel that the misuse of software is a legitimate concern but it is indeed equally applicable to any proprietary software, as the Reviewer mentions. Recognising that it is likely beyond the scope of our paper to provide real solutions to software misuse, we will nonetheless highlight in the manuscript that one solution is to make the documen-

tation as clear as possible. We will encourage expert users to contribute vignettes and documentation to their packages, or to write blog-posts or tutorial-style papers which explain how to correctly implement a specific method. Ensuring that use-cases are perceived as a useful contribution to software and the scientific discourse is a vital step forward.

"- Everybody can make an R package available, even if not carefully tested. This may result in errors that are then propagated by users. That happened to me too. I had a bug in my code but, thanks to the open source, a user spotted the error and I could correct it. When my package was first published, I received several feedback messages that helped me a lot to clean the code. The frequency has then decreased considerably meaning that, hopefully, the main errors have been solved (or that people do not use the package any more :-)"

Having said this, I believe the paper is good and worth publishing in HESS, maybe after a minor revision."

Thank you for the positive comment. We entirely agree with the Reviewer's point of view and will mention in our revised manuscript both the pitfalls (risk of errors in new packages) and strengths (community review) of the open source approach. We will also place emphasis on the importance of including tests when developing an R package.

"Small things:

Page 2, line 31: I would mention here more specifically what R is, or better what R was, i.e., software for statistics (you say that in section 2.3). This is to better inform the non-expert reader. "

Thank you - yes indeed. We will include this information.

"Figure 1: I am not a big fan of this kind of figures in review papers. The text describing it could be sufficient. "

We appreciate the reviewer's opinion but we feel this figure helps give a sense of the growth of R, providing more information than the text alone.

"Page 5, line 18: I would say here that hydrologic research is criticized for the lack of reproducibility, rather than scientific research in general."

We are not sure that hydrology is worse (or better) than many other fields, however the original reference does indeed refer to computational hydrology specifically. We will thus provide a broader discussion about about lack of reproducibility, e.g. https://www.nature.com/collections/prbfkwmwvz or https://doi.org/10.1080/13697137. 2018.1476968.

"Page 7, line 14: Maybe it is just the way I call things, but I would say that C and Fortran are very efficient in performing loop tasks. R, Matlab etc. are very good in vector operations."

We tend to agree with the Reviewer: that is true in most cases (and is the reason why the apply functions loops are coded in C). We will remove the expression "when dealing with vector operations" from our initial sentence.

"Section 2.5: Just as a note, which may be ignored by the authors if not relevant, IAHS also organises R courses in its meetings, e.g., there will be a "Using R in Hydrology" workshop at the IUGG2019 conference in Montreal. Also, among others, the PUB summer course (URL provided) uses R intensively. "

Thank you. We were not aware of these other R sessions but will definitely add this to the manuscript!

"Page 10, line 16: I would not use Twitter to discover packages, but to be exposed to communications about new packages or new features. "

Yes, we agree with this comment and will alter the text accordingly.

"Page 12, line 24: I normally use RgoogleMaps (URL provided) to interact with Google Maps."

Thank you, we were not aware of this but will mention it in the text!

"Page 13, line 15: Actually also TUWmodel can be used in a semi-distributed fashion, allowing for differentiating into elevation zones."

Good to know; we will include this information in the revised text. Although the functions describe a lumped model, we noticed in the examples that a semi-distributed application can be implemented. We will rephrase that sentence in the manuscript.

"Page 14, line 19: For regional frequency analysis I would also mention the lmomRFA package (URL provided) developed by the very father of the L-moment methodology J. R. M. Hosking."

Thank you, we will certainly include the `lmomRFA` package, as well as `lmom`, since Lmoments are important in hydrology.