Interactive comment on "Hydrology modelling R packages: a unified analysis of models and practicalities from a user perspective" *by* Paul C. Astagneau et al.

Anonymous Referee #1

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This paper presents a comparison of R packages implementing a range of hydrological models. The authors selected 8 packages among the many available, based on their ability to compare them meaningfully. The provided synthesis is intended to help users selecting the package that best fits their purpose. The paper might offer a useful guidance to R users that intend to approach hydrological modelling.

Comments.

1. My main problem with this paper is that it does not appear to fit the scope of HESS: https://www.hydrology-and-earth-system-sciences.net/about/aims_and_scope.html as it is essentially a comparison of modelling packages from an user perspective, rather

than a study that introduces new methods or provides any new process understanding. My impression is there are more suitable journal for this paper, such as the EGU journal GMD, or Environmental Modelling and Software.

2. The scope of users appears to be restricted to the R users, which is a relatively narrow scope. The authors should think of some more general insights which are useful to the broader hydrological community.

3. Why R deserves a special attention, is not sufficiently discussed. Is it the case that it is (1) more popular, and (2) more suitable than other programming languages? In terms of popularity, there are other languages often used by hydrologists for modelling purposes, including Matlab, Fortran and Python. In terms of suitability, it should be considered that R, by being an interpreted language, is much slower than compiled languages, or than Python when just in time compiler like Numba are used.

4. There is not a clear separation between methods and results, but rather, results are presented simultaneously with the methods. The disadvantages of this approach is that (1) there is no clear overview of what and how is presented in the paper, and (2) the methods for comparing such frameworks cannot be easily exported to comparing other frameworks.

5. There is not a clear separation between modelling decisions such as how to break up the catchment, which model structure to use in each landscape section, and how to reduce overparameterization and the choice of which package to use. I think the first requires a reflection about concepts, rather than about software packages.

6. There is no insight given on the numerical implementation of model equations. Although the authors note this limitation, it is not clear why this topic has been avoided, as it can be quite important.

7. The authors mention how "appropriately using a new model is fundamentally difficult", because of various reason such as software implementations, having to learn new

frameworks etc. Many of such difficulties are addressed in so called flexible modelling frameworks, which aim to facilitate model development and systematic comparisons. Such frameworks should be cited as a possible way to go to overcome such difficulties.

8. It would be useful to have a comparison of different routing approaches, and how the cell to cell (or HRU to HRU) connections are implemented in different packages.