Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2020-498-RC2, 2021

Hydrology and Earth System Sciences
Discussions

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

Elena Toth (Referee)

elena.toth@unibo.it

Received and published: 9 January 2021

The Technical Note may become an 'handbook' potentially very useful for the hydrological community. In fact, the possibility to use more than one model (and this requires also ease of use and understanding of the main limitations) may certainly widen our horizons (we all tend to stick to the model(s) we know better or, even worse, sometimes feel that there is the need to develop a new one. . .) and allow us, for example, to explore the reproductions of different main governing processes, for a better understanding of the functioning of our study basins. R is more and more used by hydrologists, especially the early-career ones, and being open-source it does not hinder the use of it by

Printer-friendly version

Discussion paper

students or colleagues with less financial resources. It follows that the analysed packages increase the possibility to apply more models without financial effort: providing some guidelines for a better understanding of what they do and on how to do it properly will also allow less effort in collecting such information from the relevant literature (and, as highlighted, the documentation is not always clear and it does not always allow comparisons on the specific issues), indeed facilitating such tests.

On the other hand, I find the manuscript a bit too lengthy and sometimes not well 'indexed': in order to become a 'handbook' it should be clearer where finding the package/model aspects that the user may want to compare/choose in a specific analysis.

In particular, I think that the attempt to keep apart but at the same include the differences due to the presence of the snow routines, make some sections much heavier and some tables much more difficult to read 'at a glance', and I would suggest considering to separate all the issues related to such routines (for the models that include it) in a dedicated section (or appendix).

I list below my comments and suggestions for the different sections.

Introduction: Lines 39-61 may be substantially shortened.

Section 2.1: I would have appreciated a wider list (acknowledging, of course, that it cannot be exhaustive) of the R-R models available in R that you have found in your search but have not been chosen (that is, not belonging to the conceptual continuous bucket-type).

Section 2.2: I would separate the different models in separate sub-sections (either numbered or just identified with a header), for a better 'indexing'.

I would move Table 2 in Section 3.2.1 (or, even better, in separate section/appendix, as suggested above).

Section 3.1

Printer-friendly version

Discussion paper

The legend of Fig. 1 is tiny and, in order to better "read" the figure, I would suggest adding in the text at l. 198 a general description of the meaning of stores and transfers represented in Figure 1. And in the figure, I would add some symbols to the colours (S for snow inside the blue box, P for precipitation arrows, etc), especially needed for the bi-coloured boxes.

I would clarify in this section that details on the input data (input arrows) will be given in section 3.3 and Table 4.

Also here, I would add separate sub-section headers for the different models.

Section 3.2.1: It would be necessary to better clarify the differences between the spatial discretization needed by the snow routines (due to the influence of elevation) and the spatial distribution of the models in general (and again, if all the considerations on snow modelling may be moved in a following section/appendix, it would help in better following the main flow of the analysis).

Section 3.3

Table 4 has too many information and I find it confusing. Again, removing the information on the snow modules, now in the parentheses, would make the table much more readable. Otherwise, I would split it into two tables (one with time steps, input and # parameters and one with the outputs). I would also make two separate columns for the inputs (that is a very important issue for the practical use of the models), distinguishing the meteorological time-series from the static catchment properties (SA, hypso, DEM, etc). In the text, separate (possibly again in sub-sections) the different issues that are discussed: outputs, inputs + number of parameters (since the availability of some static information on the catchment allows to set the values of some parameters), time steps.

Section 4.1.1: it would be better if the text addressed separately each one of the functionalities (sub-sections): preprocessing, calibration, etc.

Section 4.1.2 may be substantially shortened, leaving just a few general comments. In

fact, Table 6 is not really needed (the distinction of the meaning of different columns is not so sharp). And also Table 7 may be removed, especially since it presents information that may be updated any time, making it out-of-date.

Section 4.2 ll 548-554 may be moved in section 4.1.1 (in the functionalities section)? Fig 4 and text 554-583 should be moved after 4.3.1, since the 'user-function' boxes should be introduced first.

I find Section 5 too long: I would suggest merging, reorganising and shortening the lines from 664 to 765 (last part of section 5.1 and sections 5.2 and 5.3). It is also important not mixing issues related to the additional functionalities with those related to the documentation. As a user, I believe one of the main obstacles in the use of some R-packages is the fact that the documentation is not modular enough, that is, it does not explain in an immediate way how to do only the specific thing you want to do. And, in this case, this would be for example just running the rainfall-runoff model, without any additional pre- or post- functionality, that I may prefer to carry out autonomously.

Minor comments:

Abstract: ll 6-7: I would clarify that some packages include more than one model and the same model may be included in more than one package.

I would move ll 33-38 (all languages), before ll 25-32 (R, that is one of the possible languages)

l. 68: I would not use "efficiency" here, to avoid misunderstanding with an assessment of the simulation performance.

ll. 100-101: not clear.

ll 189-194 may be replaced with just the list of references proposing similar diagrams, without explaining in what they differ from yours.

l 345: clarify the relation between the basin partition in elevation zones (snow routine)

and in subbasins (see comment on snow appendix).

ll. 352-353: it may be highlighted that the higher flexibility of the spatial discretization of sacsmaR is obtained with a demanding pre-processing to be carried out outside of the package.

l. 628: can you explain why the HBV.INANIGLA has lower times?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2020-498, 2020.

Printer-friendly version

Discussion paper