I know I should start the review by summarizing the main characteristics of the paper, but I was unable to discern any. I broke off the review at page 5 because this paper is too carelessly prepared. The English is very difficult to understand, the HESS guidelines have been poorly adhered to. Furthermore, the paper has fundamental weaknesses.

The issues raised in the Introduction cannot be addressed by a study that relies on two small catchments located very close to each other.

The paper criticizes the use of empirical relations in hydrological modelling, then relies on empirical relationships itself.

Parts of the methodology are poorly and/or incompletely explained.

Given these problems, I do not think it is worthwhile to spend more time on this paper. I am sorry for this, but I am simply losing too much time struggling through the text.

In fact, there is no benefit in responding to a review that refers to the first 5 pages of a large article. Nevertheless, the authors are grateful to the referee for his time spent. The key and useful remark of the reviewer should be considered as a criticism of the poor English language of the article. The authors accept all language and editorial comments and intend to make serious efforts to improve the text.

Obviously, these textual difficulties did not allow the reviewer to comprehend the main idea and the results of the study, although the materials presented in article, according to the authors, quite adequately reflect them. The key problem of validation and effective verification of hydrological models is well known and widely discussed in the professional community. The authors agree with the reviewer's statement "The issues raised in the Introduction cannot be addressed by a study that relies on two small catchments located very close to each other" and did not set themselves such a task. The purpose of this article was to present efforts, and some progress, to develop an approach to solving the problem of verifying hydrological models based on a comparison of the runoff sources composition estimated by solving direct and inverse modeling problems. This goal is clearly stated in the text and seems quite natural. From the reviewer's point of view, however, "Forward modeling and inverse modeling are completely different activities with very different goals." But any of the approaches to runoff modeling is aimed at the study of the same subject and the search for the same "truth". Or does the reviewer think that the results of any methodological approach should be considered separately, and it does not matter if each of them gives its own “different truth"?

The approach developed by the authors, of course, is not new, but it cannot be considered well developed and widely used. The author's research has elements of originality and is based on a unique (for the region) data set collected over many years of own field work. In particular, it shows that the very close location of two small watersheds does not prevent them from differing greatly in terms of runoff formation mechanisms and runoff component composition, i.e. to reflect so wide range of natural conditions. The results of the study have both purely scientific and applied value.

In conclusion, the authors once again express their gratitude for the recommendations regarding the English language of the article.

Below are the comments that I was able to make.

English editing is needed. I found 4 grammatical errors in the first paragraph alone and stopped checking them after that because I do not have the time:

l.23: takes -> take
l.24: extrapolating -> extrapolated
l.26-27: challenge task -> a challenging task
l.50: ground flow -> groundwater flow

Accepted, the text to be corrected.

l.29: ...for validation flow pathways and residence times...: I do not understand what you are trying to say.
l.37-38: ...evolving model... top-down strategy: I do not understand.
l.42-43: ..the scale-dependency of HRU-based model ... small-scale physical laws... The English is so warped I cannot understand this.

Few references to facilitate reading terms:

1) P. Rodgers, C. Soulsby, S. Waldron, and D. Tetzlaff Using stable isotope tracers to assess hydrological flow paths, residence times and landscape influences in a nested mesoscale catchment https://hess.copernicus.org/articles/9/139/2005/hess-9-139-2005.html
2) Markus Hrachowitz and Martyn P. Clark. HESS Opinions: The complementary merits of competing modelling philosophies in hydrology https://hess.copernicus.org/articles/21/3953/2017/hess-21-3953-2017.pdf
3) Twenty-three unsolved problems in hydrology (UPH) – a community perspective. https://www.tandfonline.com/doi/full/10.1080/02626667.2019.1620507
4) V. K. Guptal. Rodríguez-IturbeE. F. Wood (1986) Scale Problems in Hydrology: Runoff Generation and Basin Response https://link.springer.com/book/10.1007/978-94-009-4678-1
5) Wood, E. F.: Scaling behaviour of hydrological fluxes and variables: Empirical studies using a hydrological model and remote sensing data, Hydrol. Process., 9, 331–346, https://doi.org/10.1002/hyp.3360090308, 1995.
6) Wood, E. F., Sivapalan, M., Beven, K., and Band, L.: Effects of spatial variability and scale with implications to hydrologic modeling, J. Hydrol., 102, 29–47, https://doi.org/10.1016/0022-1694(88)90090-X , 1988.

l.40: You claim that catchment hydrology is still very much empirical by quoting a single reference that is over 36 years old! This statement has no credibility at all.

The references are checked and will be updated

l.54-55: There are a number of examples...lack of suitable data sets. It is unclear to me what this means, but the second part seems to contradict the first part.

The text will be edited to clarify that it is too early to talk about the wide spread of such studies due to lack geochemical data.

l.58-59: How can you rank models based on processes?

As indicated in the text of the article, we consider the results of hydrograph decomposition by the EMMA method as factual data on runoff sources. The various runoff simulation models are ranked according to how closely they reproduce the dynamics of the runoff sources while simulating the dynamics of the water discharge.

l.60: ...based on solutions of direct or inverse task of modeling... Forward modeling and inverse modeling are completely differen activities with very different goals. Why are you using them as if they are similar?

Essentially, we look for hydrological model that can reproduce a certain runoff composition (derived by EMMA). If it does, it will indicate that this model had better represent particular hydrological system.

l.61-65: We can read the section headings, so there is no need to provide a table of contents. Instead, formulate the objective of the paper.

The text will be checked along the edition process. This study is focus on comparison the catchment streamflow composition simulated with three well-known RR models against the hydrograph decomposition obtained from End-Member Mixing Analysis (EMMA). The main objective is to choose RR model that best complying with EMMA in terms of hydrograph separation that can be related to more accurate representation of real runoff generation processes.

l.67-69: In the Introduction you criticized essentially all hydrological modles developed so far, yet you only test them on two very small catchments that are very close to each other, and are probably too small for a model relying on hydrological response units. So you cannot consider the performance for different climates, land use, geography, or size. What is the point of this study then, as related to the issues you raised in the Introduction?

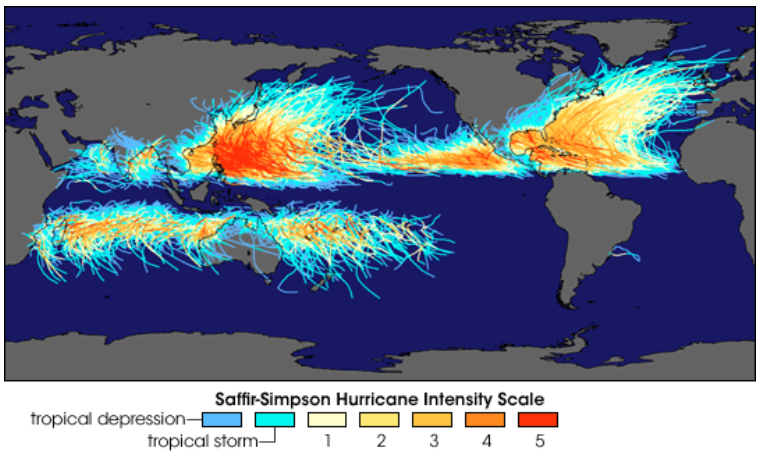
We criticize the different type of simplification in models which lead to different type of ambiguity in modelling results. In introduction, it was explained that we try to use an alternative approach for models' validation.

The appropriate HRU size is entirely subjective opinion but should be based on the data available for the object of study. In this particular case HRU were delineated according with data resolution.

The small homogeneous catchment guarantee the less noise contains in the useful signal (mainly geochemical) and the easier to make right conclusion from experiments. More area will blur measurements and complicate results interpretation. These advantages of the small test bed catchments are noted in the Introduction.

l.77: You are at the same elevation as Hokkaido and you have very cold winters. Is it really tropical there?

Tropical cyclones (typhoons) in the Northern Hemisphere can travel to high latitudes because of the presence of warm clockwise oceanic currents such as the Kuroshio.



https://earthobservatory.nasa.gov/images/7079/historic-tropical-cyclone-tracks
https://reliefweb.int/map/world/last-50-years-tropical-storms-asia-pacific-1966-2017

l.84: Without explaining the symbols, equations are meaningless.

We add an explanation for basic hydrological method Q=f(H), that is a water level-discharge rating curve, and for other cases.

l.86: I checked the reference to find out about the fair profiles number but could not find an explanation. But I found an extensive modeling exercise with ECOMAG. To what extent does this paper repeat this reference?

From the link https://link.springer.com/article/10.1134/S1064229321050057 you can check that in the study area of 45 km^2 there are 44 soil profiles, of which 14 are located directly on the studied catchments. In our opinion, this is quite a sufficient amount.

For these watersheds, the ECOMAG model was used for the first time.

l.91: The suction you apply in such instruments determines which part of the pore space you sample, but you do not report this.

Suction cups cannot sample macropores unless these remain filled for a long period of time, which is typically not the case in unsaturated soils. Did your soils have macropores?

Did you remove these during the winter? (I am not sure they survive when they freeze.)

Yes, the soil have macropores and due to this lysimeters were installed taking into account the local relief provide convergence of moisture flows and keep filling pore space as long as possible.

Observations on watersheds were carried out only in the warm season and lysimeters were removed for wintertime.

l.96: ...Data quality control suggested next simulation periods... How exactly?

Data with obvious errors associated with the operation of loggers were discarded.

l.97, 98, 161, 181: unexplained abbreviations.

We add explanation to all abbreviations even if they are widely known

l.108-109: The end-member mixing analysis...hydrology methods... Unclear.

End-Member Mixing Analysis (EMMA) is one of the well-known and widely used methods of tracer hydrology, the term often can be found in the literature

l.110: ... hereafter called fractions... A fraction is very different from a source. You need to explain better what exactly you are doing.

Terms will be checked and corrected.

l.112: ...some empirical relations... Vague. And in the Introduction you stated that reliance on empirics was a weakness of current models.

The use of empirical relationships and the use of empirical approaches in modeling are not the same thing. The remark concerns the fundamental points of the modeling methodology and reflects the misunderstanding due to the insufficiently clear presentation of the author's opinion in the text of the article. During the editing process, the authors will pay attention to a clearer wording of this position.

l.123-124: ...water quality... I believe you mean the various substances dissolved in the water.

You are right, thank you for this note.

l.126-130: This explanation of the use of bivariate scatter plots needs to be explained much clearer. What property exactly are you plotting? Concentrations, fluxes, loads during a given period? And when you state all possible combinations need to be plotted a assume you mean all possible combinations of two, i.e., only solute pairs will be plotted.

Preliminary bivariate scatter plots used for analyze the solutes. The note to be taken into account when editing the text.

What will be the effect on colinearity if one solute is non-sorbing and the other is adsorbed? Both can still be conservative.

The EMMA method implies the conservatism of tracers during mixing. The technique includes checking this condition on each specific data set.

l.179: Please consult the guidelines for authors on the use of abbreviations in equations and the font of variables.

Thank you for this note. Equations and abbreviations will be aligned with HESS compliance.