Simbi: historical hydro-meteorological time series and signatures for 24 catchments in Haiti

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Reply to reviewer #2

We thank reviewer #2 for this detailed review and helpful comments. Please find below our replies to the reviewer's comments. We provided specific responses (in black) to the reviewer comments (in *italic and blue*).

1. **ABSTRACT**

   a. *Besides being "exposed to hydroclimatic hazards" is there anything else that would make the hydrology of the area interesting? The paper could clarify this point starting from the abstract.*

   It is a region with steep slopes that generate flash floods, especially in small catchments. Additionally, the hydrology of this region is poorly understood and little studied. Clarifications will be made in the next version of the manuscript.

   b. *What are the limitations of the dataset? Why is it that mainly the 1920-1940 period is analyzed?*

   Reviewer #1 recommends dedicating a section to database uncertainties, which will be summarized in the abstract. Study limitations and uncertainties will be described in the next version of the manuscript.

   The 1920-1940 period was chosen as it is the only time period with high-quality streamflow measurements available.

2. **INTRODUCTION**

   a. *P1L45 – CAMELS also provides hydroclimatic signatures?*

   The sentence will be replaced by: *"While the CAMELS databases provide time series, indices and hydroclimatic signatures of catchments, other databases provide only indices and hydroclimatic signatures of catchments, such as the African Database of Hydrometric Indices* (ADHI; Tramblay *et al.*, 2021)*".*

   b. *P2L47 – Define "these works".*

   "These works" is replaced by "this paper".

   c. *P2L50 – It reads like there is nothing for Haiti, but it seems that the dataset was built on previous data. Shouldn't the background be provided here?*

   Thanks for the comment. This article relies on data from the BVH project conducted in Haiti in 2012. This project and the associated dataset will be better described in the next version of the manuscript.

   d. *P2L53 – What is the definition of "anarchic urbanization"?*

   Anarchic urbanization is the practice of urbanizing in a way that disregards town planning regulations. Anarchic urbanization will be better described and illustrated in the next version of the manuscript.

e. *P2L63 – "These two databases…" See previous comment on line 50.*

The two databases are (i) the monthly rainfall database (1905-2005) built by Moron *et al.* (2015) and (ii) the 70 daily streamflow series (1920-1940) from the BVH project. The next version of the manuscript will provide more detailed descriptions of the BHV project and these two databases.

f. *P2L75 – Is "producing" the appropriate verb here?*

"Producing" will be replaced by "building".

g. *P2L77 – Why for the 1920-1940 period?*

The of 1920-1940 period is chosen as it is the only time period with high-quality streamflow measurements available.

3. DATA USED

a. *L90 – What is the meaning of 70 daily series, but 24 are used? Why 1920-1940? Provide a better description of missing data etc.*

70 streamflow series are available, with 24 being then selected for rainfall-runoff modeling based on their quality. The process for selecting streamflow is explained in section 3.1.1.

This section will be further detailed in the next manuscript version, incorporating comments from reviewer #1 and reviewer #2.

b. *L106 – Can you also provide a graph showing missing data periods and percentage?*

The percentages of missing data will be quantified and presented graphically in the next version of the manuscript.

c. *L122 – Exactly what significant gaps?*

An arbitrary threshold of five years has been set, beyond which missing data is considered significant. The percentages of missing data will be quantified and presented graphically in the next version of the manuscript.

4. METHODOLOGY

a. *L138 – Why for 21 of 24?*

24 streamflow series were selected from a total of 70. Monthly rainfall-runoff modeling was performed on those 24 associated catchments. However, only 21 of the 24 catchments had available daily rainfall series. Consequently, daily rainfall-runoff modeling was performed for these 21 catchments. This will be clarified in the next version of the manuscript.

b. *L159 – Why were the remainder not provided?*

These streamflow series were not selected because they are located downstream of diversion canals or small dams used for irrigation. They poorly represent streamflow seasonality and are therefore considered to be influenced by human activities. This paragraph will be reworded in the next article version.

c. *L169 – What is the meaning of "numerically calculated"?*

Catchment contours were delineated using algorithms (digitally) as opposed to contours estimated using topographic maps in historical times. This paragraph will be reworded in the next version of the manuscript.

d. *L171-172 – What does it mean to "relocate manually"?*

The provided geographical locations for certain stations did not correspond to the information in the hydrographic bulletins. The locations of these stations were

rectified utilizing the information available in the hydrographic bulletins. This paragraph will be reworded in the next version of the manuscript.

e. *L174 – What "numerical model"?*

The "numerical model" is the DEM (digital elevation model). This sentence will be reworded in the next version of the manuscript.

f. *L177 – This is not clear.*

Rivers generated with SRTM DEM differ from real rivers. Thus, station positions must be relocated to match the rivers generated by the DEM processing. This paragraph describes the station relocation process.

This paragraph will be better described in the next version of the manuscript.

g. *FIG.1 – Provide Haiti country boundary. Are the gray lines the river network? How to consider if a raingauge is relevant? What are the white dots?*

Gray lines indicate the river network; white dots represent non relevant raingauges. Relevant rain gauges are defined in section 3.2.1.

In the next version of the manuscript, a precise illustration of Haiti's boundaries and a more comprehensive figure legend will be provided.

h. *L187 – Is this the best method to identify appropriate raingauge?*

This method seems to be the most appropriate for identifying the relevant raingauges for rainfall-runoff modelling. Indeed, the performance of a rainfall-runoff model improves with a better description of the rainfall input (Andréassian *et al.,* 2001). The GR2M model was therefore used to determine the relevant raingauges in this study. Relevant raingauges are defined as those with the best performance of the model. The results with GR2M are a first estimate of relevant raingauges to ease future work.

The limit of this method is the dependence of the relevant raingauges on the GR2M model used. This paragraph will be better described in the next version of the manuscript.

i. *L213-214 – Can this be shown in a figure? What is a continuous catchment rainfall?*

Continuous catchment rainfall is a catchment-scale rainfall series with no missing data. This will be clarified in the next version of the manuscript.

j. *L216-221 – This is not clear.*

This paragraph describes the procedure for calibrating and evaluating the performance of the GR2M rainfall-runoff model over two distinct sub-periods, P1 and P2, for each catchment.

This paragraph will be better described in the next version of the manuscript.

k. *L222-224 – Why was it used then? This is contradictory to the previous explanation.*

This paragraph presents the limitations of the method used and explains the dependence of the results on the rainfall-runoff model used.

This paragraph will be better described in the next version of the manuscript.

l. *L253 – What is the meaning of "most relevant method"?*

This sentence has been reworded as follows: *"Moreover, it is one of the most relevant approach to calculate PET for use in rainfall–runoff compared to 27 models for calculating PET and has been tested on more than 300 catchments covering several climatic zones, including tropical zones (Oudin et al., 2005), as is the case in Haiti".*

m. *L263 – Parameters are called "Period 1"… this is not clear and not the best choice of terms.*

The three periods used for calibration will be referred to as P1, P2 and P3 in the next version of the manuscript.

n. *L277 – SRTM and catchment attributes should be all explained in the same section.*

SRTM and topographic attributes will be explained in the same section.

o. *L283 – to produce… are produced.*

This sentence has been reworded as follows: *"The data used to calculate the geological attributes, land cover characteristics, and aquifer types are produced by the CNIGS (Centre National de l'Information Géospatiale) and the BME (Bureau des Mines et de l'Energie)".*

p. *L288-292 – Should be clearly explained/justified in the beginning. I figure showing the changes would be interesting.*

This paragraph will be better presented in the next version of the manuscript, taking into account your comments and those of reviewer #1. Geology, aquifer types and land use datasets will be better described. Additionally, we will provide illustrations showcasing the evolution of land use.

q. *Fig. 3, 5, 6, and 8 should be moved to supplement. This is not well explained and get in the way of the analysis.*

Figures 3, 5, 6 and 8 will be moved to the supplement in the next version of the manuscript.

r. *Fig 4 and 9 – The color pallet is not appropriate.*

An appropriate color pallet will be used in the next version pf the manuscript.

s. *Fig 10 – Why this figure? Is this an average for the entire country? How relevant for understanding the hydrology of the region is this?*

This figure shows rainfall and streamflow (observed and simulated) regimes. It shows i) the seasonality of rainfall and streamflow in Haiti, with two periods of heavy rainfall/streamflow around May and between September and November, and ii) a comparison of observed and simulated streamflow regimes. Each of the three regimes is calculated using data averaged over the entire country.

The paragraph describing this figure will be better described in the next version of the manuscript.

t. *Fig 13 and 14 – Instead of this bars, isn't it better to provide a map of the geology and aquifer type of the region? Check most of the CAMELS papers for good examples.*

Thanks for your comment. We will draw inspiration from the CAMELS databases to better represent geology and aquifer types.

u. *Fig 15 – This is a great example of useful graphics for having a quick look at the data and also precious information for decision makers.*

Thanks for this comment.

5. CONCLUSION AND PERSPECTIVE

a. *L528 – "over several decades" seems to be a stretch when considering 1920-1940.*

"Over several decades" will be replaced by "over several years".

b. *L531 – Please, define and show in a figure what is meant by massive deforestation and anarchic urbanization, otherwise, delete it.*

The massive deforestation and the anarchic urbanization will be defined and illustrated with figures in the next version of the manuscript.

c. *L533-535 – Strange choice of words for these two sentences. Maybe delete?*

These two sentences have been reworded as follows:

"Frequency analysis methods can be utilized to estimate flood return periods. The accessibility of streamflow data allows for the possibility of various rainfall-runoff modeling approaches to be applied".

6. REFERENCES

Andréassian, V., Perrin, C., Michel, C., Usart-Sanchez, I., Lavabre, J., 2001. Impact of imperfect rainfall knowledge on the efficiency and the parameters of watershed models. Journal of Hydrology 250, 206–223. https://doi.org/10.1016/S0022-1694(01)00437-1

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Tramblay, Y., Rouché, N., Paturel, J.-E., Mahé, G., Boyer, J.-F., Amoussou, E., Bodian, A., Dacosta, H., Dakhlaoui, H., Dezetter, A., Hughes, D., Hanich, L., Peugeot, C., Tshimanga, R., Lachassagne, P., 2021. ADHI: the African Database of Hydrometric Indices (1950–2018). Earth System Science Data 13, 1547–1560. https://doi.org/10.5194/essd-13-1547-2021