

Dear Editor and Authors,

Below is my review for the manuscript entitled: "Analysis of the streamflow extremes and long term water balance in Liguria Region of Italy using a cloud permitting grid spacing reanalysis dataset".

### General comments:

The author's positively addressed most of my previous comments, however, there are some issues that I think remain in the manuscript and are detailed below. Main concerns are: (1) model parameters description, (2) forcing data used for calibration and (3) the discussion about attributing most - if not all - modelling issues to lack of calibration. I acknowledge that the writing improved, but I think the text can be further improved throughout the manuscript. I recommend moderate revisions to this paper before accepted to HESS. I think with just a bit more work this paper can be greatly improve and hopefully published.

### Specific comments:

#### **Material and Methods**

- P7,L6: I don't think that a 1000 km<sup>2</sup> basin can be considered small
- P7,L14: what do you mean by "rigid" winters?
- P7,L5: why did you chose CDF among other approaches, can you name pros and cons (support your decision)?
- P7,L24: "seamlessly" I'm not sure if this is the adverb you want to use. Do you mean "continuously"?
- P8,L10: Add units.
- **There is no information about the parameters that requires no calibration, how were they obtained? For example, where is the Leaf Area Index (LAI) parameter coming from? Same for all the other parameters that are not mentioned in the manuscript (these are as important as calibrated parameters). This needs to be included.**
- P11,L16: Incoming shortwave?
- Still unclear the use of the term "section" in the manuscript, if you mean gauge station, sub-basin or basins, please use that instead, it is confusing.
- **I don't understand why the authors perform model calibration and validation using observed meteorological records, but then they move forward and do the analysis using the reanalysis product. In my opinion this is flawed and wrong, you should use the reanalysis to perform calibration/validation to prove that the model represent reasonably well the streamflow regime, and then, you can argue that the model is appropriate for the long-term analysis using reanalysis. Authors should reconsider this. If the reanalysis is really close to the observed meteorology (after all the corrections), results will show a good streamflow representation, but you need you show this.**

- P13,L13: It is unclear why you introduce Curve Number here? If its a parameters that the model requires it should be in a section describing the model parameters (with all the other parameters as well), otherwise explain.
- P14,L3-7: reword.

## Results

- P19,L20-23: The authors blame calibration for all the mismatches they found. This is only one part of the problem. See comment below.
- **P20: 10-16 (figure 11): I think this is also the result of errors compensating and the authors should at least mention it (see the previously shown mismatches in figures 8 to 10 and table 5, to support the errors compensating). I can see that this can be useful for ungauged basins, but you have to keep in mind that there are a lot of uncertainties here that are not properly addressed in my opinion (not everything can be attributed to errors in parameter calibration, there are also uncertainties in model structure, non-calibrated parameters and input data). You should include a paragraph with a more comprehensive assessment (discussion) of the uncertainties and problems with the model. There is a lot of literature about this; here are some examples that you could look at:**
  - Liu and Gupta, 2007: Uncertainty in hydrologic modeling: Toward an integrated data assimilation framework, Water Resources Research, 10.1029/2006WR005756.
  - Wagener and Gupta, 2005: Model identification for hydrological forecasting under uncertainty: Stochastic Environmental Research and Risk Assessment, 10.1007/s00477-005-0006-5.
  - Walker et al., 2003: Defining Uncertainty: A Conceptual Basis for Uncertainty Management in Model-Based Decision Support, Integrated Assessment, 10.1076/iaij.4.1.5.16466.
  - Beven, K., 2007: A manifesto for the equifinality thesis, Journal of Hydrology, 10.1016/j.jhydrol.2005.07.007.
- Explicit the value of  $A_{th}$  in page 20 and figure 11.
- P21,L15: This potential relationship between Ratio (T) and area is biased because the size of the sample is biased too (only few large basins and many small ones) and it should be stated in the text (not only here, but in other sections in the manuscript).
- Include a table with the details about the observed streamflow and meteorological data used in the study (period, gaps and official ID – if available-). This table should be included as supplementary material.

### **Other minor comments:**

- Figure1: Add scale. Avoid acronyms (everywhere in the text too, unless previously defined). Such as FR, MC and IT. There is no curve number in the figure (see caption).
- Figure3: group the subplot in boxes by season and add an identifier, such as (a) for summer, etc. and describe it in the caption.
- Figure4: can probably be removed as the numbers are in Table 4 already (too many figures).
- Y-axis label figure 5 and 6: change to “**mean** monthly cumulative rainfall”
- Include legend in figure 5 and 6.
- Include axis units in figure 2, 3, 5, 6 and 16.
- Figure 8, 9 and 10: Change units format to “ $m^3 s^{-1}$ ”.
- I still think that 16 figures is too much and some figures can be either merged, simplified or moved to supplement material.
- Table1: Include official ID number for the sub-basins (sections?). Don’t capitalize “Slope”. Typo in “height”.
- Table2: What is “AP”. Are these values for calibration or validation? Unclear. Include the period of analysis in the caption.
- Table5: What are the first “p-values” and “K-S test” associated with? Avoid using B.C. unless defined in the table caption.
- Table 6: What’s “N. Program”. Too many acronyms not defined throughout the text, avoid them unless explicitly defined.
- Abstract: What’s “inter alia” streamflow?
- Many typos (more than previous version actually). Just to name a few examples:
  - o Peri et al (2015) instead of Pieri et al (2015)
  - o Krog et al (2015) instead of Krogh et al (2015)
  - o Page7, L5: “et c” instead of “etc”
  - o Page7, L9: there is a “.” in the middle of the sentence.
  - o Page 7, L22: “:” in the middle of the sentence.